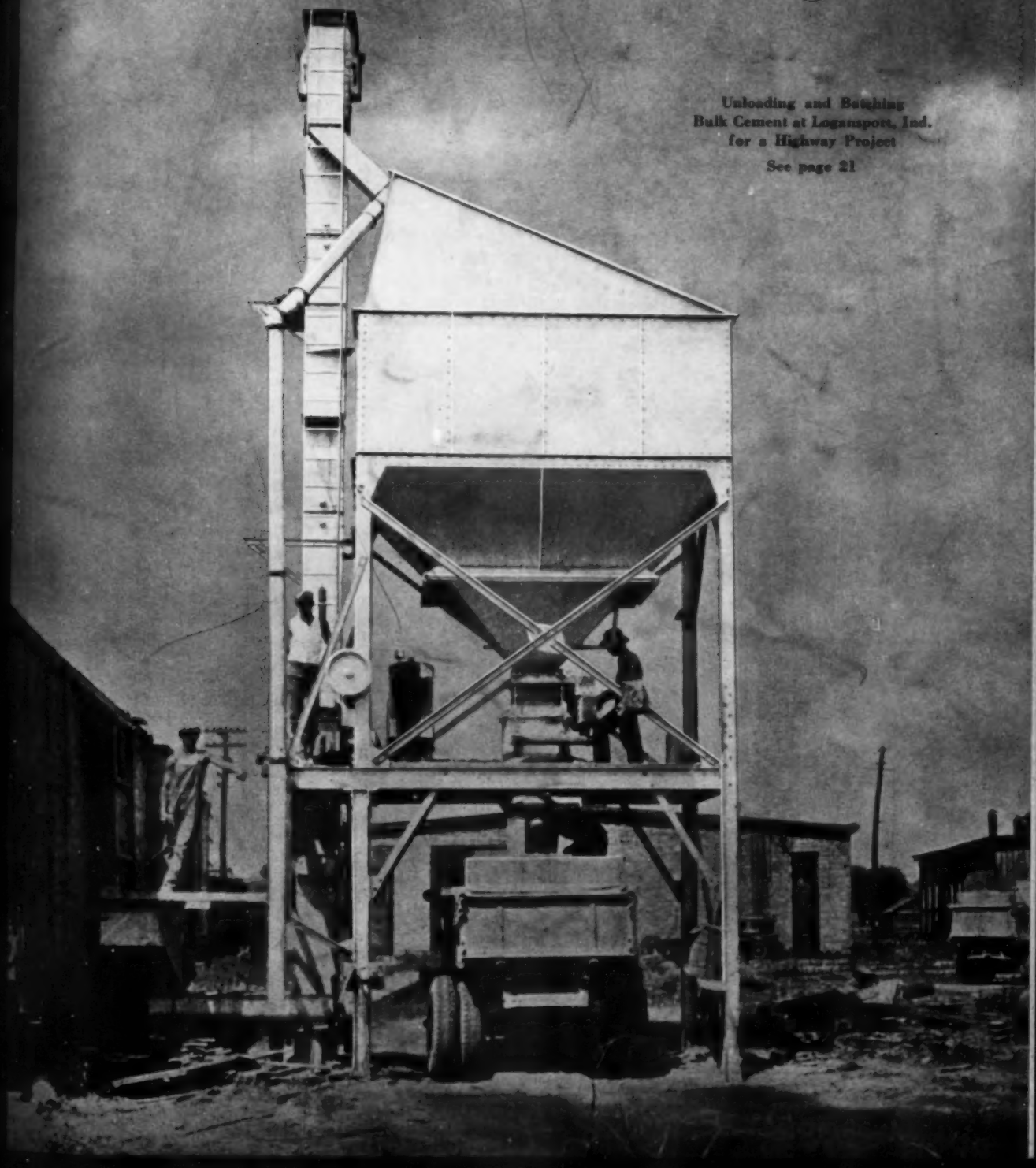
LY, 1932 7TH TIER 25 Cents, $1 a Yea

Contractors and Engineers Monthly



Unloading and Batching Bulk Cement at Logansport, Ind. for a Highway Project

See page 21

Building a County Road *by* Straight Drifting

Contractor Moved 110,000 Yards of Dirt in Ten Miles Casting and Blading a Mile in Six Days

ONE of the county roads was rebuilt during the 1931 construction season for Monona County in western Iowa by the Clyde W. Drew Co., grading contractor of Omaha, Neb. The job was handled as a straight drifting job with the elevating grader working in the ditch and casting straight to the road with the road taking the same rises and falls as the ditch. But the County required that the road be graded to the "blue tops" set to line and grade which necessitated the use of a 2-yard Killefer rotary scraper pulled

The Grade, Slope and Ditch All Made by the Grader

The Grader and Tractor That Built the Road

by the same Caterpillar Sixty that handled the elevating grader and the blade grader.

The first round of the Caterpillar 42-inch elevating grader was next to the road bed alongside the stakes. The second round was worked a little further down the 1½ to 1 slope and then across the bottom which was from 6 to 8 feet wide with a back slope the same as the slope to the shoulder of the road. The County purchased a 66-foot right of way for the 24-foot crown roadway, allowing the contractor 63 feet in which to work. The extra 3 feet was divided between the two sides at the fence line and allowed the setting of fence posts without the change of their being disturbed by the grading operations.

The job was handled a mile at a time, the grade first being cast from the ditch by the elevating grader. Then the Adams 12-blade grader was pulled over the section to trim the grade after the low spots had been filled by the rotary scraper. The work was started May 20, 1931, and completed August 1. The crew, consisting of the tractor operator, a grader man, an extra man and the superintendent, worked 12 hours a day. About six days were required for the completion of a mile of road by this method. The intersections where there was an excess of earth required were filled with the rotary scraper and the drives were handled by two teams with Western fresnos hired locally as required. The teams worked 3-up on the fresnos.

The "grief" on this job was the large number of big roots of maple and walnut trees along the ditch. The trees and stumps had been removed by the County but the large roots remained and caused many delays in the operation of the elevating grader. Three heel braces were broken during the work until one was built by the superintendent that was strong enough so that the safety pin sheared instead of breaking the brace itself. All the smaller roots which were cast onto the grade were removed by hand as the work proceeded. The soil worked was a gumbo, or river bottom silt. Gumbo is a generic term in the middle and south west for anything that is of a sticky nature when wet, running from the gumbo of the northern section through Oklahoma and the buckshot gumbos of the lower Mississippi Valley.

For the Clyde W. Drew Co. of Omaha, the work was in charge of H. Earl Smith as Superintendent.

1932 Awards for Distinctive Bridges

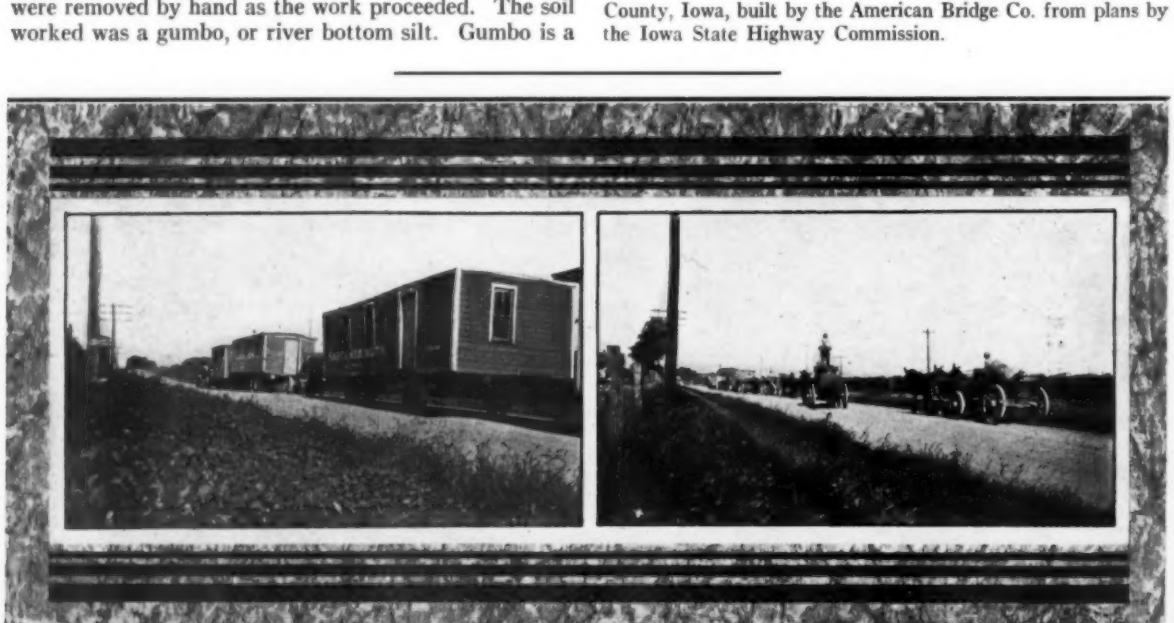
THE American Institute of Steel Construction, New York City, has announced the awards for the most beautiful bridges erected in 1931, classified in three groups according to cost: Class A, for structures costing in excess of one million dollars; Class B, for those costing in excess of one quarter of a million dollars and under a million dollars; and Class C for those costing less.

The Bayonne Bridge over the Kill von Kull between Bayonne, N. J., and Staten Island, N. Y., received the award in Class A. This bridge was erected by the American Bridge Co. for the Port of New York Authority, and was designed by O. H. Ammann, Chief Engineer for the Port of New York Authority. This is an arch bridge having a main span of 1,675 feet, the longest arch bridge in the world.

The award for a Class B structure was given to the Waldo-Hancock Suspension Bridge with a main span of 800 feet over the Penobscot River, Bucksport, Maine. It was erected by the American Bridge Co. for the State of Maine from designs by Robinson & Steinman, Consulting Engineers, New York City.

The West Stewartstown Bridge over the Connecticut River at West Stewartstown, N. H., received the award for Class C structures. This bridge was erected by the American Bridge Co. from plans by the State Highway Department.

Bridges selected in each of the three classes for honorable mention are: Class A, Maumee River Suspension Bridge, built for the City of Toledo, Ohio, by McClintic-Marshall Corp., from designs by Waddell & Hardesty, Consulting Engineers, New York City; Class B, Croton Lake Arch Bridge at Croton Lake, N. Y., built by the Mount Vernon Bridge Co. from designs made under the supervision of Jay Downer, Chief Engineer for the Westchester County Park Commission; Class C, Afton Overhead Cantilever Arch Bridge at Afton, Union County, Iowa, built by the American Bridge Co. from plans by the Iowa State Highway Commission.

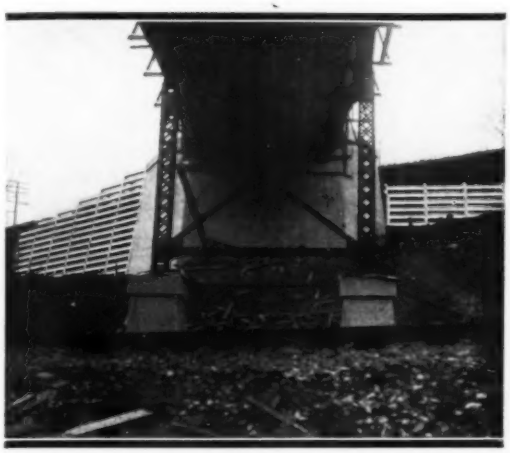


MOVING CAMP AND 80 HEAD OF MULES 80 MILES IN 3 DAYS

The Editor met this Sargent & Roth dirt moving outfit from Keystone, Iowa, on the road. Houses, families, commissary, everything except the mules, was on wheels and either motor-driven, tractor-drawn or hauled by the mules.

An Unusual Cribbing Installation *in* West Virginia

Highway Bridge Over Railroad Required Wing Wall Extension to Safeguard Fill Above Railroad Drainage Ditches



A View of the Two Walls, the Small One Not Having Been Completed at the Time This Photograph Was Taken

IN the improvement of U. S. Route 250 running from the east into Fairmont, W. Va., it was necessary to erect a bridge approximately 400 feet long over the Monongahela Traction line, Buffalo Creek and the B & O Railroad. The approach to this bridge on the railroad end was so located that some form of wing wall extensions were necessary to safeguard the fill and prevent its sliding into the railroad drainage ditches. It was decided to build a metal crib wall 36 feet long to extend the right wing, shown in the third illustration, because the road swings to the right in connecting with the existing highway, and a second wall 18 feet long to extend the left wing.

The plans for such extensions were made for metal cribbing with concrete cribbing specified as an alternate. Bids were received and the contract awarded to the low bidder who elected to use metal cribbing.

For these installations open-faced walls were specified,—walls without units or fillers between the stretchers. The stretchers, the longitudinal units in the wall, were 8 feet long. Headers, the units perpendicular to the face of the wall, were 6 and 8 feet long.

Installation Procedure

In an effort to save on the cost of excavation, trenches for the base course were excavated 12 to 18 inches wide instead of removing all of the material inside the cribs. At the corners of the cribs, concrete pedestals were poured, each 18 inches square and extending 2½ feet below the bottom of the foundation trench.

The large wall is 19 feet 4 inches high at the highest point next to the abutment and decreases uniformly to 10 feet at the lower end. For the type of load to be carried by the wall, the highest portions were designed with a 12-foot base, that is the distance between the front and rear faces. To save further on excavation at the back crib, the 12-foot width of wall was not started until two courses, or 28 inches of height, had been reached in the front cribs. Because of this procedure, it

Erecting the Front and Back Cribs. Note the Man at the Right Carrying Two Units.

was decided to use headers, the units running back into the wall, perpendicular to the face on 3-foot centers for the two bottom courses to insure a better foundation and greater stability against overturning.

As the height of the wall increased, the backfill, which consisted of wasted material from a cut several hundred feet from the wall, was dumped by trucks and pushed into the cribs by a bulldozer or shoveled in by hand. The backfilling material was clay with a small amount of soft sandstone which packed well with no tendency to flow through the open face.

The large wall, open faced, with the end of the headers covered with header caps for appearance's sake, was built on a 1¼-inch batter in 12 inches so as to conform to the batter on the concrete portion of the wing wall.

ERECTION OF THE SMALL WALL

The small wall, designed during the erection of the large wall, is 18 feet long, 12 feet 4 inches high at the end next to the abutment and 10 feet at the lower end. After the first few courses, the width was decreased to 6 feet and that width carried to the top. Only an 8-foot base was necessary on this smaller wall which received additional support from a thin rock ledge.

PERSONNEL

The work for the wing walls was handled by Ralph Fimple, Contractor of Fairmont, W. Va. W. K. Knauf, District Engineer, supervised the installation for the State Highway Commission of West Virginia.

PROGRESS PHOTOGRAPHS IN THE ERECTION OF A METAL CRIBBING WING WALL EXTENSION

1. A view of the bridge looking toward Fairmont, W. Va. 2. Trenches were dug to receive the lower courses of the crib wall. 3. The three rear cribs were used to give the high end of the wall the necessary stability. 4. A bulldozer and sheepsfoot tamper at work on backfill at the same time the cribbing was being erected.

A Building Contract—B. C.

"Everything Has Its Price; and If That Price Is Not Paid, Not That Thing, But Something Else, Is Obtained"

THAT contractual relations before the Christian era were at least as good as they are today is the gist of the first portion of a most interesting copyrighted booklet by Morton C. Tuttle, President, Morton C. Tuttle Co., Engineers and Managers of Construction throughout New England and the East. With recourse to the story of the building of the temple by Solomon, Mr. Tuttle demonstrates the value of personal faith of builder in owner and owner in builder.

The paramount requirement of one construction project may be low price; of another, speedy completion; of yet another, the highest possible quality of materials and craftsmanship. The promise of disproportionately low cost reduces the probability of achieving quality and speed. Assurance on the latter score calls for a reliable check on expenditures.

Of one thing, however, the buyer should be aware in any case. Just as it is axiomatic that two objects cannot occupy the same space at the same time, it is axiomatic that the same target cannot be reached by aiming simultaneously in two opposite directions. A contract in apparent contravention of this law may be written and solemnly signed, but it will not—indeed, cannot—be literally fulfilled. Under its operation the owner may accomplish the chief one of the ends in view; he cannot hope to accomplish all. Hence it is important that, before selecting the type of contract under which his work is to proceed, the owner should fully make up his mind as to what he really wants, and then determine which one of the several kinds of contract available is most likely to achieve the desired result. This responsibility of selection ordinarily is not one that may rightfully be surrendered to an agent. It represents a primary function of management, upon whose wise exercise hinges the success or relative failure of an enterprise calling for the fixed investment of capital, and hence entailing permanent consequences for good or for evil. It may accord with conventional procedure to delegate authority in the matter of building contracts; but as conventional procedure at this point assures conventional handling throughout, it is certain to yield conventional dissatisfaction.

The Wisdom of Solomon

If the contention that the control of contract making should invariably be retained by management and should never be delegated were merely an expression of personal opinion, it might, perhaps, be questioned. It is, however, sustained by at least one famous example, that of King Solomon, whose superlative wisdom has been acknowledged by successive ages. Let us, for a moment, attend to the Biblical account of how this wise old monarch went about the building of his temple, of the business arrangements that he concluded, and of the eventual outcome of his undertaking. After that we may theorize a little as to what might have happened if he had proceeded according to modern conventions.

Those who read their Bibles will recall that Hiram, King of Tyre, possessed more than a local reputation as a builder and as a dealer in building supplies. When Solomon's father, King David, built himself a house, we read:

"And Hiram, King of Tyre, sent messengers to David, and cedar trees, and carpenters, and masons: and they built David an house."

At his father's command, Solomon proposed to erect a temple of the best materials and of the finest workmanship. He wished this building to be completed as quickly as possible. When news of the proposed undertaking reached Hiram, the Tyrian salesman was alert, for we read, further:

"And Hiram, King of Tyre, sent his servants unto Solomon; for he had heard that they had anointed him king in the room of his father."

Thereupon Solomon made a contract with Hiram, the most trustworthy builder of his acquaintance. Likewise, he agreed to cooperate with his builder in every way calculated to forward the work, saying:

"Now therefore command thou that they hew me cedar trees out of Lebanon; and my servants shall be with thy servants: and unto thee will I give hire for thy servants to all that thou shalt appoint: for thou knowest that there is not among us any that can skill to hew timber like unto the Sidonians."

It seems odd to find an owner praising a contractor and that, too, before closing their agreement. Such procedure would be considered most imprudent within these United States. There is a delightfully human touch in the enthusiastic outburst of the contractor who has just been awarded a mighty job:

"And it came to pass, when Hiram heard the words of Solomon, that he rejoiced greatly, and said, 'Blessed be the Lord this day, which hath given unto David a wise son over this great people.' And Hiram sent to Solomon, saying, 'I have considered the things which thou sentest to me for: and I will do all thy desire concerning timber of cedar, and concerning timber of fir.

" 'My servants shall bring them down from Lebanon unto the sea in floats unto the place that thou shalt appoint me, and will cause them to be discharged there, and thou shalt receive them: and thou shalt accomplish my desire, in giving food for my household.' "

And the Good Book adds:

"And there was peace between Hiram and Solomon; and they two made a league together."

So we have the outline of an order to deliver hewn timber f.o.b Joppa, and "to perform such other work necessary for the completion of the contract."

Apparently the seven and one-half years occupied in constructing the temple were considered a reasonable period; the quality of the workmanship proved to be excellent. The job ended, we may assume, with everybody entirely satisfied. That blissful outcome is, without doubt, largely attributable to the fact that the arrangement between Solomon and Hiram was made on a basis that permitted the builder, without penalizing himself, to meet in full the wishes of the owner. And these, it will be remembered, were [*early completion, and the employment of high-grade material and workmanship*].

IF SOLOMON HAD BEEN LESS WISE

Now let us assume that, instead of making his business arrangements directly with Hiram of Tyre, Solomon had told his architect to look after the securing of materials and labor for erecting the temple. Under such circumstances, the first idea likely to occur to the appointee would be the necessity for extreme vigilence in protecting the financial interests of his client. He would reason thus with himself:

"To demonstrate my faithfulness to my client, I must make sure that the prices charged for materials and for workmanship are the lowest that it is possible to obtain. To be sure, these low prices may mean such inferior materials and such slow progress that my client will be disturbed. Even so, I must seize one or the other of the horns of this dilemma. A cheap job will inevitably be a poor one; but, if I deal with Hiram of Tyre, whom I believe to be the man best equipped for this work, mistakes may be made for which King Solomon will grudgingly pay; and besides, I have no personal knowledge that Hiram is entirely honest. He may pad his payrolls. He may supply materials other than those called for.

"Under these conflicting circumstances I will follow conventional procedure: I will carefully describe just what is wanted in materials and in workmanship, and I will specify a date for delivery of the temple. I will persuade King Solomon to approve this description. I will invite competitive bids from a number of competent firms, and will obtain the King's permission to close a contract with the one offering the lowest price and the quickest delivery. After that, of course, the results are more or less uncertain; but the responsibility will not be entirely mine.

"In advertising for bids I will specify that 'the carving is to be done in the best manner, in accordance with full-sized details to be furnished later.' This will enable me, in the meantime, to ascertain my client's exact wishes in the matter of decoration. I will also add that 'the successful bidder is to enter into an agreement on our standard form of contract.'"

At this point the architect may have piously exclaimed, "May God guide me fully to understand the force of the specifications I write, for I am no lumber expert, and this firm from Tyre specializes in that material.

"Because the roads from Joppa to Jerusalem are in bad condition, and no man can tell the cost of hauling lumber over such roads, I will insist that the lumber must be delivered f.o.b. Jerusalem, instead of f.o.b. Joppa."

IN SPITE OF AN EXACT AGREEMENT

Assuming that only "the best contractors" had competed, and that Hiram of Tyre had secured the contract; and assuming further that the "standard form" of agreement between Hiram and Solomon had been drawn by lawyers who knew how to put teeth into it—even so, is it probable that the temple operation would have moved as smoothly to as early and as satisfactory a completion as under Solomon's method?

It takes neither a prophet nor the son of a prophet to perceive that, under a drastic legal code, arguments would have arisen over the builder's receipt of the first full-sized detail; that messengers would presently have been tearing from Jerusalem to the lumber yards of Tyre to ask why in the name of all the seraphim the roof timbers had been delivered before the sills, and why the door trim was coming before the framing.

The real reason for this order of delivery doubtless would have been that the standard form of contract provided for the making of payments on "delivery and measurement of all material," and that it was convenient and profitable for the boys at Tyre to get out the roof timbers ahead of other requisites. Rather than stack them at Lebanon, they sent them along to Jerusalem, and let the job handle them.

As it was in Solomon's day, so it is in this.

A. S. T. M. Adopts Viscosity-Temperature Chart

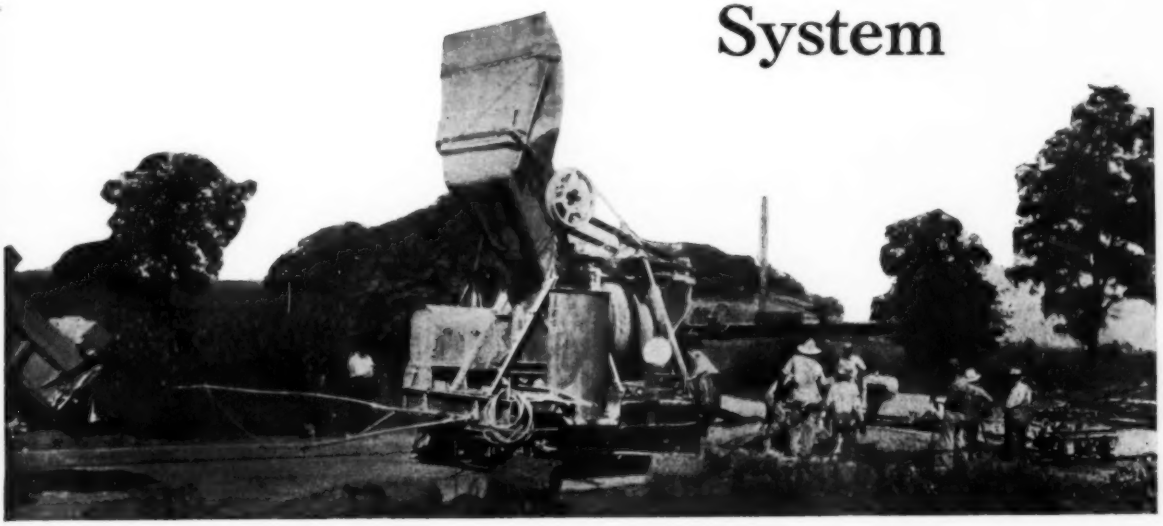
A VISCOSITY-TEMPERATURE chart has recently been approved as a tentative standard by unanimous action of Committee E-10 on Standards of the American Society for Testing Materials. It was prepared by the A.S.T.M. Committee D-2 on Petroleum Products and Lubricants, which has been working on the problem for some time. Their efforts have resulted in a chart which will be of distinct service to the petroleum, automotive and other industries. This new standard incorporates the best features of all the previous charts used, particularly the generally used charts of Larson and MacCoull. It is printed in a large size, 16¼ by 21½ inches, covering a temperature range from —30 degrees Fahrenheit to 450 degrees Fahrenheit and a viscosity range of 37 to 100,000,000 Saybolt Universal seconds. This chart is useful for the solution of many problems, such as those involving a prediction of performance under varying temperature conditions of crankcase oil, free-wheeling lubricant, transmission lubricant, etc.

These A.S.T.M. Viscosity-Temperature charts may be secured from the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Penna., for 25 cents a single copy, $1.50 for a pad of twenty-five, or $5.00 for four pads of twenty-five.

We regret that the article describing the Central Engineering Co.'s work in southeastern Iowa announced for publication in this issue has been necessarily held for the August issue of CONTRACTORS AND ENGINEERS MONTHLY.

A Complete

Bulk Cement Handling System



THE advantage of bulk cement to the contractor is chiefly the saving that can be effected in the cost of this part of the concrete. To the State it offers an opportunity to more readily design the batch so that the maximum production of the strongest concrete can be secured. With all the accuracy of the weighing of the bulk cement at the docks and the careful checking of the total weights with the weights of the cement shipped, there seems to be in general a notable laxity in the handling of the cement from the cement cart to the paver. First, the dumping of the cement into the batch truck, whether from a commercial plant or a dock devised by the contractor, has had little attention and several pounds of the cement are more frequently lost than not. Second, in spite of the covering of the cement with sand, there are frequent "geysers" of cement spurting from the trucks as they drive over rough grades. Third, the dumping of the batch into the skip offers altogether too good an opportunity for the cement to spurt out the side of the skip. These losses are not consequential to the contractor as he is paid for the completed pavement and as long as the cores or beams that are tested by the inspectors show the required strength he has no kick. Still, there remains the great waste of cement that should be stopped. If the required strength can be secured in the concrete with a weighed batch of 666 pounds of cement and 5 or 6 pounds are lost through careless handling, then with careful handling the same strength should be secured with 660 pounds of cement.

Bontrager Construction Company Built Own Cement Boxes So That Batch Was Delivered to the Skip Without Spilling

All this brings us to the description of a job where the cement was handled with the least amount of waste from car to skip. The Bontrager Construction Co., on its 11.7-mile concrete road job on Route 29 north of Logansport, Ind., last summer, used a commercial cement handling plant and batch boxes of its own design. The Universal cement was received in box cars on a siding adjacent to the spur where the aggregates were dumped into separate pits for handling. The cement was removed from the cars by an automatic scraper operated by one man and a hoist which was a part of the Butler bulk cement plant. As the man pulled back on the power scraper the tension of the cable kept the hoist out of gear, but as soon as he slacked the line a counterweight threw in the clutch and the hoist pulled the

ECONOMICAL HANDLING OF AGGREGATES AND CEMENT AT THE BATCHING PLANT

1. The crane located between the railroad pits and the batcher. 2. The power scraper in the freight car handled by one man brought out a full load of cement to the bucket of the cement elevator on each trip. 3. The complete bulk cement plant.

scraper to the door and pushed the loose cement into the receiving hopper of the plant. There were two men who alternated on this work. In the hopper the cement was moved laterally to the Caldwell bucket elevator by a screw which was run by the 20-horsepower LeRoi engine which furnished the power for the scraper, the screw and the elevator.

The 671 pounds of cement was delivered from the weighing batcher to the batch trucks through a heavy rubber tube. Instead of being simply run out onto the sand or into a hole dug in the sand and then covered, the cement was placed in a welded steel container so designed that it greatly improved the flow of aggregates into the skip at the paver and prevented the throwing of the cement when dumped. Each of the multiple-batch trucks was equipped with a batch box for each batch, placed against the tail gate for the first batch and against the partitions for the remainder. The box was 10 inches wide at the top and ran across the full width of the truck. It widened slightly to 12 inches at a point 15 inches below the top and below this at the back toward the dumping side it was open, depending on the tail gate or partition to hold the cement in place. The bottom sloped toward the back and left a clear space of 8 inches for the aggregates to flow through into the skip. While dumping the batch into the skip the cement was completely covered with the gravel and there were no signs of spilling in the half a hundred batches we saw dumped. The top of the cement container was covered except for an opening 10 x 12 inches through which the heavy rubber delivery tube of the Butler plant spouted the cement into the box. A cover was placed over this in transit. The cement filling the bottom of the container first and then rising and forcing the air out through the opening did not scatter as is the case when the entire batch is dumped at one time, entraining air which tends to rise as in a fluid and form a miniature geyser.

HANDLING OF AGGREGATES

Both sand and gravel were shipped in to the siding at Logansport by the American Aggregates Co. from its large pits about 5 miles west of Logansport, Ind. The aggregates were dumped into separate pits beneath the tracks and loaded into the Blaw-Knox batching plant by a Northwest crane with a 40-foot boom and a ¾-yard Owen clamshell bucket. A Novo hoist was set up about 50 feet from the batching plant and was used to move the cars of aggregates as they were unloaded. About sixteen cars were cleaned up in a day. Three men took care of the unloading, cleaning up the sand cars, the gravel cars being practically self-cleaning, and handling the hoist and cable. There was a crane operator and a weigh man on the batcher and between the batcher and the cement plant there was a leveler who saw to it that the batches were level between the side boards so as not to spill in hauling to the paver. The batches were composed of 2,241 pounds of gravel, 1,271 pounds of sand and the 671 pounds of cement.

A fleet of twenty privately-owned trucks, with one of the contractors, of which three were 3-batch and the remaining 2-batch, hauled the batches. The owners were paid by the batch hauled to the paver and a man at the paver gave each driver a ticket for each load, designating the number of batches in the load.

ROUGH GRADING

Rough grading was started June 22, 1931, with a 1-yard Northwest shovel, and two Caterpillar Sixty tractors, one on a 12-foot Adams grader and the other pulling four 1½-yard Baker-Maney wheeled scrapers. The shovel worked with three or four Federal 4-yard trucks which hauled an average distance of 1,000 feet, as the cuts and fills balanced at about 2,000 feet.

The new road is entirely relocation as far as the old route is concerned but the new grade is over an old

railroad right of way which was narrow and had to be widened to care for the 20-foot concrete road with the necessary shoulders. In addition to the operators of the machines listed above the only other men on the rough grade were an engineer giving lines and setting stakes and a man dumping the trucks. A Huber 10-ton gasoline roller was used to compact all the fills.

A Small Fine Grade Organization

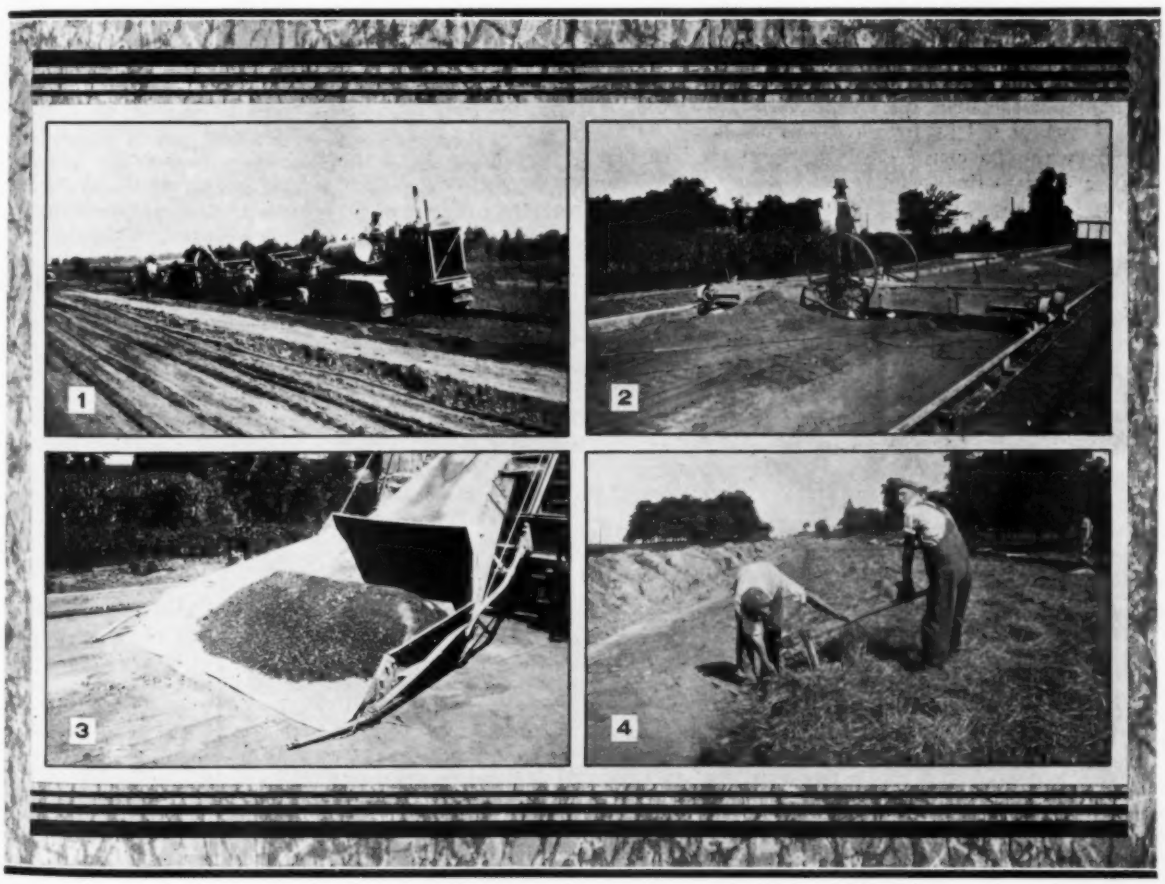
The trimming of the rough grade to the proper elevation for the slab was handled by a very small organization. A Caterpillar Twenty with an Adams 1-yard rotary scraper took off the high spots, and it also pulled an Adams grader with a 6-foot blade to cut the side trench for the forms and the thickened edge section for the 9-7-9-inch slab. Four men cut the final form trenches by hand and then the two form setters placed the 9-inch Lakewood steel forms. The grade was then cut out to final shape by a Hug subgrader and rolled to firmness with a Huber 5-ton roller.

From Batch to Slab

The heavy batch trucks drove up the grade with their dual pneumatic tires preventing any excessive cutting of the grade and turned through spaces left after the forms were set. Use was made of the old road to the east of the new route as much as possible with the numerous cross roads cutting through. This kept the heavy trucks off the new grade, gave them a well-maintained macadam road to travel, and in large measure kept the grade clear for the grading equipment that was working ahead of the paver. One man ahead of the paver replaced the forms in the gaps and lined them up.

The batches were dumped at the paver by one man. They were all uniformly dumped well back in the skip with practically no spilling at the edge of the skip and no rush of cement over the edges of the skip as is so frequently noted. The batches flowed into the skip so that the sand was on the bottom, the cement in the center and the gravel on top with the cement well distributed through the aggregates and not in evidence on the top of the batch. The Rex 27-E paver pulled a Carr subgrade planer and a scratch template and two men shoveled the excess earth away from the planer. The grade was sprinkled by the man who set the Truscon center steel with the cross dowels. A man who oiled the forms behind the paver also set the ¼-inch marginal bars in pressed steel chairs 6 inches from the forms and 6 inches from the grade. These bars were dipped in a bituminous compound before being placed in the slab.

Two puddlers handled the spreading of the concrete



A CLOSE-UP OF SOME OF THE OPERATIONS ON THE ROAD

1. *A train of four 1½-yard wheeled scrapers pulled by a Sixty tractor handled the long stretches of rough grade.* 2. *The subgrade planer cutting the grade to final shape.* 3. *A typical clean dump into the paver skip.* 4. *After the straw cover for curing had been placed, the stakes were pulled and the forms stripped.*

as dumped by the paver bucket and also spaded at the forms. The Ord finishing machine carried an operator and a helper who shoveled to the strike-off as needed and watched the strike-off to prevent the spilling of concrete along the forms. There were two hand finishers who used checking straight-edges 10 feet long, next 10-foot long-handled floats and then used the Lakewood power belter and finally edged the slab. Indiana places no expansion joints in the concrete slabs, preferring to let its maintenance forces cut out any breaks due to expansion of the slab in excessively hot weather. According to reports, it is felt that this is cheaper than installing expansion joints at regular intervals which may or may not be sufficient for the expansion of the slab. From observations last summer, where old and new pavement with what seemed like an adequate provision of expansion joints failed at the joints and elsewhere, there can be little criticism of the policy. Expansion joints have become so universally used as preventive measures that this radical policy of "let them break when and where they will" stands out. The nearest approach to the expansion joint is the bulkhead that is placed at night with six dowels across the construction joint to bond the two slabs together.

CURING THE SLAB

Two men carried the burlap forward from the previous day's work and spread it on a rolling bridge with large specially cast wheels. From the bridge they spread the burlap on the new slab and sprinkled it. On the following day a crew of six men spread straw over the slab after removing the burlap, sprinkled the straw which was kept wet for ten days, and pulled the forms. A team with two men loaded the forms and carried them forward to the setters.

At intersections where the local farmers would be decidedly hindered by having the road closed for a period of ten days the State of Indiana requires the contractor to build bridges over the slab at the end of three days or to add three extra bags of cement to each batch at the intersections to give a high strength concrete in three days so that the intersection, after being covered with earth, can be opened to cross traffic of reasonable weight in that time. The contractor in this case chose to use the extra cement as less expensive than the bridges.

WATER SUPPLY

A Novo triplex road pump furnished the water for the sprinkling of the grade, the paver, and the sprinkling for curing. It supplied these requirements with a single 2½-inch pipe laid along the shoulder well away from the forms. The paver hose taps were placed every 200 feet in the line. In accordance with the best practise the contractor carried two lines of paver hose with two valves at the paver so that the second hose could be carried ahead and connected without disturbing the first hose and then the valves were closed and opened and the paver operated without the loss of a single batch. Each paver hose was 150 feet in length.

PERSONNEL

This very interesting paving project was completed by the Bontrager Construction Company, of Elkhart, Ind., in the fall of 1931. The contracting organization is composed of A. B. Bontrager, President, J. C. Bontrager, Treasurer and General Manager; D. P. Huffman, Secretary, and Carl E. Moore who acted as Superintendent in charge of paving operations. B. E. Phelps was Field Engineer for the Indiana State Highway Commission, with Forrest Higgins, Project Engineer.

Penetration Macadam with Asphalt Emulsion in New Mexico

THE section of New Mexico State Highway immediately north of Raton in Colfax County has unusually heavy grades and sharp curvatures in mountainous country. The prohibitive cost of relocating the road and reducing the grades has forced the state to utilize the existing location, which was constructed some years ago as the first Federal Aid Project in New Mexico.

The original surfacing was crushed basalt macadam built under specifications which permitted the use of large size stone in the surface. The heavy rock surface was very difficult to maintain in smooth condition and was extremely annoying to traffic. Covering the rough cobble surface with gravel was costly and unsatisfactory because of excessive wear. In 1929, the roadway was widened throughout, curves were reduced as much as possible, sight distances were increased, ditches were enlarged and driving conditions were otherwise improved. It was desired to place on the steep grades and sharp curves a type of surfacing requiring low initial investment which could be maintained at reasonable cost. Experiments were made with two types of surfacing, laid on the steepest grades, including oil-mixed gravel and penetration macadam made with an asphalt emulsion. These sections received a severe test during the winters of 1929 and 1930. The oil mix was definitely rejected from further consideration because of shoving and corrugating in warm weather. The penetration macadam stood up well. Office studies were made to compare the penetration macadam with concrete pavement. The macadam was estimated at $14,000 per mile and the concrete at $35,000 and the difference of $21,000 was so great that the saving in interest would more than cover the estimated maintenance cost of the macadam.

In August, 1930, a contract was awarded to Armstrong & Armstrong, contractors of Roswell, New Mexico, for 1.86 miles of penetration macadam, 3 inches in compacted thickness. The contract price was $1.03 per square yard including 2 x 6-inch wooden side forms to remain in place. The state purchased and furnished the Bitumuls asphalt emulsion to the contractor. Work was begun in September, 1930, and completed in December, 1930. Stone was obtained from crushing malpais boulders gathered from the mountain side. To complete the final application of Bitumuls on the last 1,500 feet of the work, it was necessary to sweep off snow and melt ice in the interstices of the rock with blow torches. Under these adverse conditions, however, the work was completed satisfactorily.

The construction operations included first the spreading of 3 to 1½-inch aggregate to a 4-inch loose thickness. This was rolled lightly, trued up and rolled until firmly locked. The allowable variation from a 10-foot straight-edge was ¼-inch. On this base was spread ¼-inch to 10-mesh stone chips which were rolled and broomed to fill the coarse rock for one half of its depth. Then Bitumuls H was applied at the rate of 1 to 1¼ gallons per square yard. This was covered with stone screenings of ¾-inch to 10-mesh to fill the remaining voids then rolled and broomed. A second application of the emulsion at the same rate was made and covered with stone chips of ¼-inch to 10-mesh. These were broomed for uniformity and to fill the voids which were in the key rock and then were rolled thoroughly and broomed again and the road opened to traffic. A seal coat of the emulsion was not specified, but was placed later. This macadam is still in first rate condition.

Altering Wrought Iron and Steel Bridges by Welding

By

Frank P. McKibben

Consulting Engineer,

Black Gap, Pa.

PREVIOUS to the transition period approximating the years 1885-1890, the principal metal used in metallic bridges was wrought iron; but since that time, practically all metallic highway and railway bridges have been made of steel. Steel was first used in the Eads Bridge at St. Louis in the early seventies, but this was unusual.

So far as the present study is concerned, wrought iron is pure iron. The amounts of carbon, silicon, sulphur and manganese contained therein are negligible; but introduction into the iron of very small amounts of these elements produced steel, and resulted in one-third to one-half greater tensile strengths. Changes in manufacturing methods lowered costs of production so that by 1890, soft or medium steel containing approximately 0.15 per cent carbon came into general use for structural work. In recent years, copper-bearing and other alloy steels, such as those containing nickel or silicon, are coming into use.

Of the many wrought iron bridges and early steel bridges in service at present, some are now inadequate because of corrosion or because of great increases in loads to which they are subjected. In 1885, a loaded wagon weighing 5 or 6 tons was considered a reasonable live load for use in proportioning highway bridges not subjected to electric cars. In 1930, the writer used 30-ton trucks in designing the floor system of a large bridge in a city where 20-ton trucks were then in service. Thus have the loads increased.

In many cases, these highway or railroad bridges can be given a very considerable increased longevity by repairing or reinforcing with the aid of welding. The influences which create a need for alterations may be classified as corrosion, cracks due to overloading or to defective metal, excessive stresses and re-adjustment of existing members.

Corrosion

Wrought iron bridges seldom become inadequate because of corrosion, but steel bridges frequently suffer from this influence. Rust on wrought iron takes the form of small spherical particles, easily brushed off; whereas on steel, it appears in large sheets or laminations of oxides, sometimes as thick as ¼ inch. As this deterioration is usually localized,—as for example at supports where the metal is in contact with earth, at points where wooden floors cover steel stringers or floor beams, at places where planking is in contact with or close to girders or truss members, or at contact points between concrete and steel,—the addition of new material welded in place is efficacious.

Figure 1 illustrates a simple use of welding to add a new plate to an inclined end-post of a highway bridge in Pennsylvania where corrosion had formed a 2 by 16-inch hole in a channel web. A short reinforcing plate was placed inside of the post and welded to the channel.

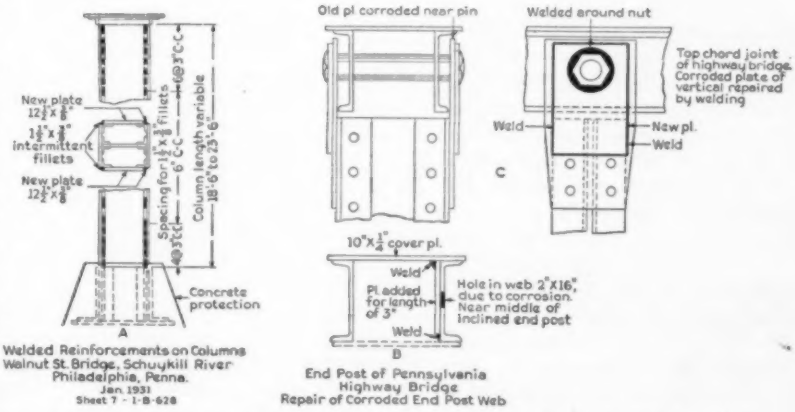


Figure 1—Reinforcing the Channel Web of a Truss End-Post Where Corrosion Had Formed a 2 x 16-inch Hole in the Web

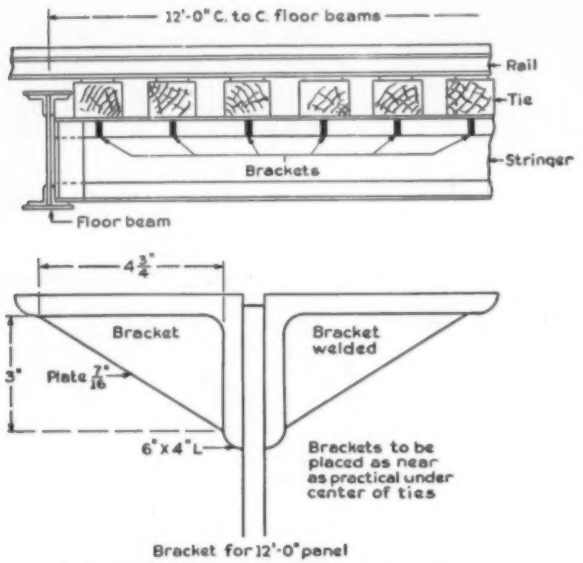


Figure 2—Reinforcement for Outstanding Legs of Flange Angles Where Loads Directly Applied to Top Flanges Form Cracks at the Roots of the Angles

One of the most interesting applications of welding to replace corroded metal is that of the New York Central Railroad's overhead highway bridge at Brook Avenue, Borough of Bronx, New York City. This structure, as well as bridges at East 163rd Street and East 149th Street, had exposed girder lower flange plates badly corroded by gases from locomotives passing underneath. The old flange plates were removed, a few at a time; the old steel was thoroughly cleaned, and old exposed rivet shanks chipped off; then new flange plates were welded in place of the old ones without appreciably disturbing the concrete arches in contact with the girders, except insofar as necessary to provide places for clamps. But as the dead load stresses in the bottom flanges were large, it was necessary in applying the new plates to give them an initial dead load stress comparable with that in the bottom flange angles which the corroded plates were removed and to which the new plates were welded.

This transfer of stress was accomplished by first clamping the new plate to the old angles. Then, with two welders operating, a 30-inch continuous fillet was deposited on each side at one end of the new plate to weld it to the angles. With the plate clamped in position and thus welded at one end, it was heated with torches until its length was increased by a predetermined calculated amount, and while subjected to this heat, the free end of the plate was welded, likewise with two 30-inch continuous welds, after which intermittent welds were placed at 3-inch intervals on each side. The cooling and consequent shortening of the plate transferred some dead load stress from the old angles to the new plate. Strain-gage readings on several plates indicated that the stress induced in the plates agreed with that desired. Clearly, this process of heating need be applied only where the unit dead load stress is large, that is, where it constitutes a large percentage of the combined dead and live load stresses.

Cracks Due to Overloading or to Defective Metal

Defects resulting from cracks are most likely to appear in structural details such as angles connecting stringers to floor beams; or top flange angles on stringers of railroad bridges which crack horizontally along the junction of vertical and horizontal legs due to bending of the latter resulting from flexure of track ties resting directly on the angles.

Figure 2 presents a method of strengthening the outstanding legs of stringer upper flange angles by welding triangular bracket plates after the cracked material is cut out and replaced by depositing weld metal at the root of the angle. This method of adding metal to the root of angles is also applied where the angles exhibit weakness but are not cracked.

Excessive Stresses Due to Overloading

Increases in weights of vehicular traffic on highway bridges and of locomotives on railway bridges constitute the most common cause of strengthening wrought iron or steel bridges. And generally this inadequacy manifests itself in the floor system, although trusses are sometimes light for the duty imposed on them.

One of the best illustrations of reinforcing bridges, too light for present day traffic, is that of the Chicago Great Western Railway's Missouri River Bridge, Leavenworth, Kan., consisting of one 440-foot through draw and two 330-foot through fixed spans, designed by George S. Morrison, and built in 1893. Adequate for the live load of 3,000 pounds per linear foot for

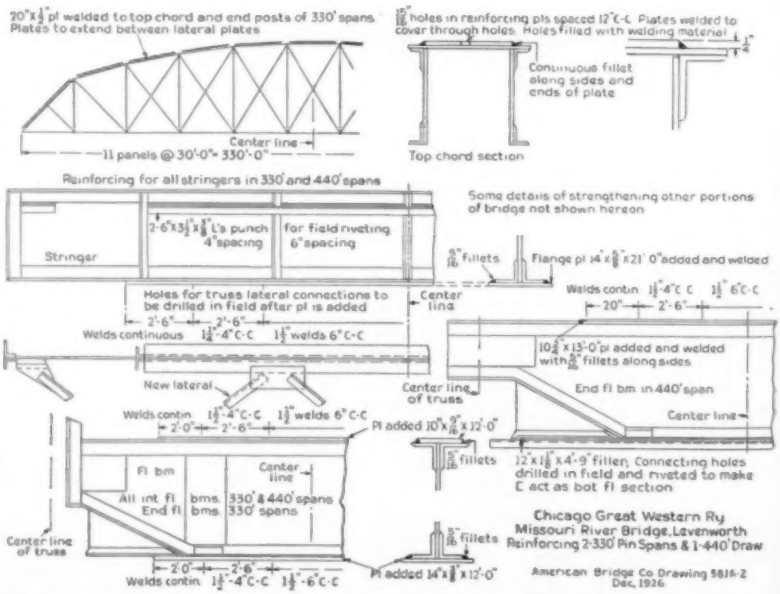


Figure 3—Reinforcing the Chicago Great Western Railway's Missouri River Bridge at Leavenworth, Kansas, by Welding

which designed, the structure had to be reinforced or rebuilt to accommodate heavy current traffic. Between the dates of February 28 and April 28, 1927, 225,000 pounds of structural steel reinforcing, involving the use of 2,000 pounds of welding wire to deposit 7,500 linear feet of welding, were applied without interruption to the heavy traffic of the three railroads using the bridge. This strengthening provided for a single locomotive with 55,000 pounds on each pair of drivers, followed by a uniform train load of 4,000 pounds per linear foot. Figure 3, showing the welded details, indicates that additional plates were welded to the top chords and end posts of the fixed spans, to the bottom flanges of all stringers, to the top and bottom flanges of all floor beams; and that changes were also made in the top flanges of all stringers and in parts of the lateral system.

The addition of a narrow plate to the top, and of a wide plate to the lower flange of the floor beam is the arrangement frequently used, and is desirable in that it permits downward or horizontal welding and avoids over-head welding.

RE-ADJUSTMENT OF EXISTING MEMBERS

Re-adjustment refers particularly to shortening inactive eye-bars in pin-connected bridges, that is, eye-bars which are too long and require shortening to make them carry their proportion of the stress in a given truss member. This has been applied to several pin-connected trusses, notably one bridge where inactive eye-bars 12 by 1⅞ inches were shortened with the aid of adjustable yokes bolted to the eye-bar and abutting against bearing plates, ShP, Figure 4, previously welded to the eye-bar. By adjusting the turnbuckles the stress is removed from the enclosed portion of the eye-bar after which a short section of the main bar is taken out, and two splice plates SP added by welding. The bolted yoke is then removed.

GENERAL DIRECTIONS FOR WELDING PROCEDURE

Wrought iron or low carbon steel of which the older metallic bridges are built are easily welded. Welding is used in cases similar to those described in this paper because it results in economies. In general, it is by far the cheapest and best method available.

If arc-welding is used, the proper current may be supplied by a generator driven by an electric motor if electric power is available or by a gas engine if no electric line is at hand. For hand-welding wrought iron or low carbon structural steel, using a 5/32-inch bare wire electrode, the amperage should be about 160 to 180 when depositing ¼ to ⅜-inch fillets on steel of ¼ to ⅜-inch thickness; the lesser current for the smaller, and the greater for the larger fillets and thicknesses.

If bare electrodes are used their chemical composition should be approximately as follows:—carbon, 0.13 to 0.18 per cent; manganese 0.40 to 0.60 per cent; phosphorus and sulphur not over 0.04 per cent each; silicon not over 0.06 per cent.

In general the work to be welded should be the positive, and the electrode the negative side of the circuit.

Corroded iron or steel should be cleaned of dirt, rust and paint before welding is applied; and if corrosion has proceeded to the point of leaving thin edges on angles or other similar parts, the thin portions should

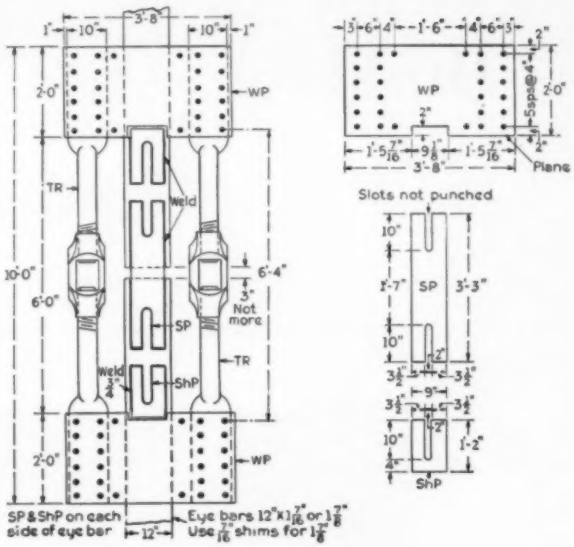


Figure 4—A Device for Shortening Inactive Eye-Bars in Pin-Connected Trusses

be removed till adequate thickness is reached whereon welding may be applied.

Care should be exercised to secure good penetration of the weld metal into the parts welded.

Not infrequently one sees plates welded to flanges of stringers or floor beams with intermittent fillets. As this arrangement permits water to enter between the reinforcing plate and the original flange parts, continuous instead of intermittent welding seems preferable, and is not very much more costly.

QUALIFICATION OF WELDERS

As only capable welders should be employed on important undertakings, all applicants should be tested at the beginning of the work to ascertain their fitness; and, if the project be of sufficient magnitude to warrant it, those employed should also be tested at intervals during the progress of the work. The qualification tests for determining their competency are well standardized by the American Welding Society, 33 West 39th Street, New York, N. Y.

EXTENT TO WHICH WELDING IS USED

The writer's list of welded structures includes 75 bridges in which welding has been used during the last four years to reinforce or alter existing bridges, but doubtless there are many others. On the whole, railroad companies have been much more favorably inclined toward the use of welding than have State Highway Departments, although several of the latter have become very active during the past year in applying this modern tool to those cases where applicable.

There are times when hand labor is as economical as the use of power equipment. In the article "Features of 344-Foot Concrete Bridge" in the August issue will appear a discussion of just such a situation.

Building a Sand Asphalt Cut-Off

HYANNIS is the metropolis of the south shore of Cape Cod, Mass., with its larger shops and shopping center. This brings tourists and people from the summer colonies for miles around into the bee hive of activity until in mid season the main street is like Main Street of any small town. The cut-off built last summer by the Lane Construction Co. will tend rather to heighten this congestion as it by-passed several of the small communities to the east of Hyannis. It is understood that a new through highway may be built later to be known as the Mid Cape Highway, so named by enthusiastic chambers of commerce, which will entirely eliminate the congestion in this summer metropolis.

Sand asphalt construction and Lane Construction Co. are one and the same on the Cape. Lane has been building the fine roads of this economical type from the Cape Cod Canal east to Chatham for several years. This is one of the best organized and one of the fastest pieces of paving they have done in their years of work in that territory.

Quantities

The contract called for the excavation of 96,000 cubic yards of material from the right of way and the excavation and placing of 13,600 cubic yards of "hardening." This is a term used in Massachusetts for the placing of a layer of clay or loam and rolling it to stabilize the shifty sand subgrade. The contract figure of 21,400 tons of sand asphalt was increased on the job to over 26,000 tons because of widening to 40 feet instead of 24 feet at the intersections and also the excessively large intersection at the east end of the contract. Here excellent planning is in evidence as this highway will be one of increasing importance and hence deserves attention in the matter of improving traffic conditions.

There were 4,214 feet of 12-inch vitrified clay tile laid for drainage, 6,638 feet of 12-inch reinforced concrete pipe, 127 feet of 18-inch concrete pipe, 72 feet of 36-inch concrete pipe, 162 feet of 48-inch concrete pipe, and 112 feet of 54-inch concrete pipe. The laying of the larger pipe was done in the winter when the work could be expedited by allowing the trench to freeze as it was excavated and do away with a large amount of shoring and the need of pumping so much water. For the 36, 48, and 54-inch pipe two Universal cranes were used. One would dig with a ½-yard clamshell while the other laid the pipe as rapidly as the trench was prepared. This method was used continuously in wet ground where the water was dammed with temporary earth dams.

The intersections were carried to a minimum width of 40 feet for 100 feet each side of every important crossroad and then narrowed gradually to the standard width of 24 feet in the next 300 feet.

Excavation and Grading

This 100 per cent relocation job required the clearing and grubbing of 19 acres of land. The excavation was handled by a P & H 1-yard diesel shovel, a ⅞-yard Erie steam shovel and an Insley ½-yard gas shovel. There were ten hired trucks, paid by the hour, used to handle the spoil. Two Caterpillar Twenty tractors with bull-dozers handled all the spreading of the material on the dumps for the fills, and a Galion grader with a 12-foot blade smoothed the grade ahead of the fine grade crew.

A novel method of handling the trucks to prevent miring on the fills was developed. All the trucks were

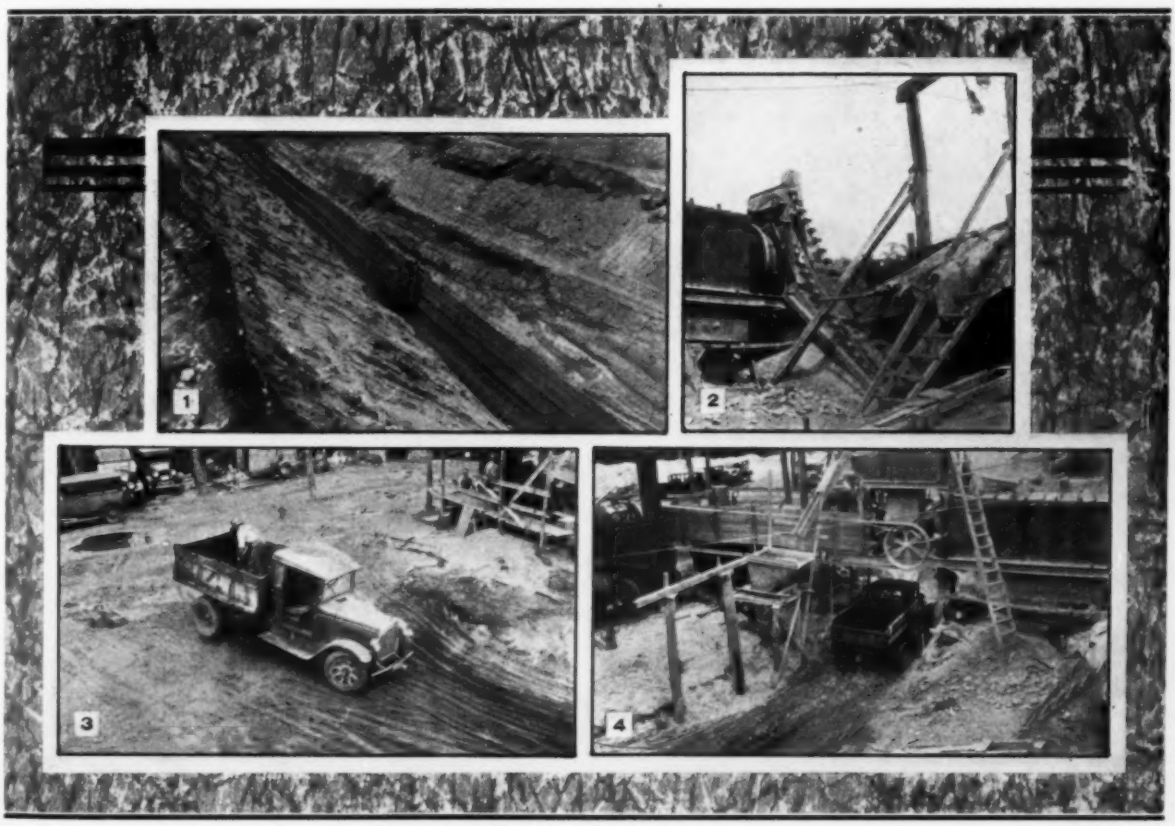
Lane Construction Co. of Meriden, Conn., Pushed Job Through Sand and Scrub Pine on Cape Cod

equipped with dual pneumatics on the rear, but even this was not sufficient to prevent the trucks getting mired when at the extreme end of some of the fills where sand was being used. Anyone who has driven off the road where "ball bearing sand" exists knows how quickly the most powerful car or truck digs in. To prevent this, the contractor provided a 4 to 6-inch pole about 10 feet long and two men who laid it down on the soft fill for the trucks handling the excavated material to back onto. The pole fitted between the dual pneumatics and held up the truck perfectly. The wear on the tires was nothing compared to the cost of hauling trucks out every few minutes before this method was devised.

In addition to the truck and shovel operators there were two men around each bulldozer and a pit man for each shovel. A 10-ton Buffalo-Springfield steam roller with three wheels was used on all fills and on the "hardening." Just ahead of the placing of the mix, a 5-ton Buffalo-Springfield gas roller was used to compact the grade where it had been cut up by the trucks.

THE HOT-MIX PLANT

In the many years of sand asphalt work on the Cape, "Chuck" Woodhouse, who has handled practically all of the Lane jobs of this type, has aimed toward an ideal plant set-up in which the trucks could drive in one side of the plant, circle it, receive their batches and then drive out without any backing. This, as most concrete men know, is an ideal which they, too, would like to attain at batching plant set-ups but the lay of the ground prevents it in the famous "99 out of 100". "Chuck" realized his ambition on this job and produced a "merry-go-round" for the trucks. The 1,000-



OPERATIONS AT THE ASPHALT PLANT

1. *The scraper bringing in a load from the sand and gravel pit.* 2. *Feeding the screenings to the drier of the asphalt plant.* 3. *Swabbing out the steel body of one of the asphalt trucks with oil before taking on another load.* 4. *A truck ready to receive its load of sand asphalt. This picture shows quite well "the merry-go-round." Trucks entered the plant in the left background, swung around the left side of the plant, thence beneath the mixer and out to the grade.*

pound batch Cummer asphalt plant was set up at about the middle of the job parallel to the right of way with the asphalt kettles at the right as one faced the plant from the road. The sand and gravel was brought in from an extensive pit at the left with a Sauerman scraper operated by a Clyde double drum hoist with a Waukesha motor. The sand was stored behind a barricade and admitted to the pit serving the sand elevator through a gate. At the opposite side the screenings were admitted in the proper ratio. The screenings were hauled by truck from a railroad siding at West Barnstable, a distance of 3 miles. The Socony asphalt was delivered at the same siding and hauled to the kettles by an 800-gallon tank truck.

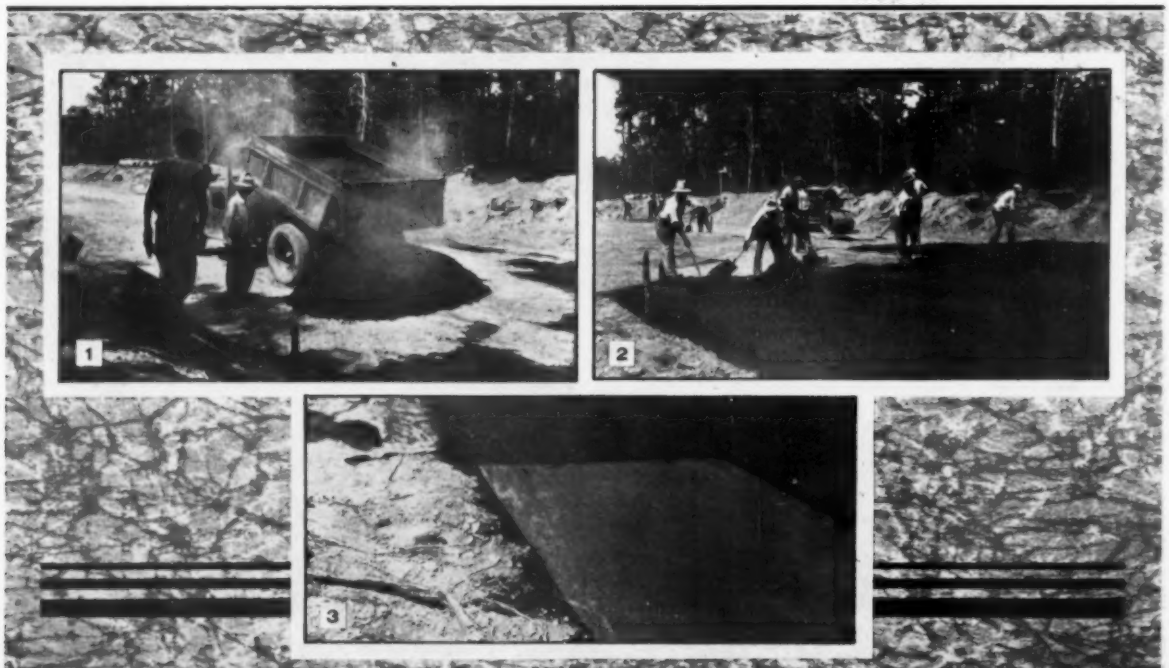
The asphalt was delivered from the trucks to the kettles by a Kinney asphalt pump. A second pump was used for the delivery from the kettles to the weigh bucket. A double elbow attached to the pipe leading to the pump permitted horizontal and vertical movement of the pipe to closely fit the position and elevation of the truck. A union on the end of the pipe was used to attach the pipe securely to the truck before pumping started.

Some of the unusual features at the asphalt plant were the hot and cold showers provided by the contractor for the men at the plant and for the laborers so that they might be clean on quitting work at night. This has been a feature of every job handled by "Chuck" Woodhouse in the past few years and has done a lot to make the men contented and improve their morale. A hot shower at the end of the hottest day greatly improves anyone's outlook on life. Evidence of the tendency to economy on the part of labor because of the scarcity of jobs and the fact that this might have been his first in a year, was shown in the number of one and two-man shacks that had sprung up around the plant. Some of these had the chairs and tables for eating and lounging after hours built nearby. On this job was one laborer who has owned his own contracting organization and manufacturing plant. He took his licking with a smile and was one of the best workers on the job. All power to him and may he be on his feet again ere long!

The labor organization at the asphalt plant consisted of: one man on the dragline supplying sand, one man regulating the flow of sand to the elevator and one man for the screenings, one man required to handle the trucks on the screenings or dust dump above, one man on the plant weighing the heated sand, another weighing the asphalt, a fireman and the foreman to complete the crew. The plant produced between 275 and 325 tons of sand asphalt daily, working a maximum 10-hour day and a 48-hour week. The hauling trucks with steel bodies which were oiled at each trip back to the plant hauled two or three batches per load. They were weighed for tare at the start of the day and at noon and then every time they left the plant loaded. A set of Standard scales of the platform type were provided close to the plant where the state inspectors noted the weights delivered.

PLACING THE HOT MIX

The trucks with the material from the plant approached the job from the unpaved side and turned near the site of the placing. The work was handled by two crews working in parallel, each crew consisting of two rakers and two shovel men. The material was dumped to fill a 6 x 6-foot steel pan from which the shovel men



TRANSFORMING THE SAND ASPHALT INTO A FINISHED ROAD

1. *Dumping part of a load onto a batch board preparatory to spreading by hand.* 2. *Spreading and raking the mix to a uniform consistency.* 3. *An interesting comparison of the sand asphalt before and after rolling.*

PLACING THE CONCRETE EDGING ON A GRADE

1. *The trench dug by hand and some of the precast concrete slabs spotted along the shoulder.* 2. *These two men set the precast curb with remarkable speed and alignment.* 3. *Newly set curb ready for backfilling.*

moved it to the road between the forms of 16 to 18-foot screeds or 2 x 4's. The material was immediately rolled parallel to the forms by an 8-ton Buffalo-Springfield tandem gas roller. Any low spots or high spots shown by straight-edging the pavement were immediately corrected by adding more material or raking out the excess. At the end of the first roll on any freshly placed material, a raker immediately loosened any material piled up by the roller and reraked it to prevent fat or hard spots at the ends of the rolling stretches.

The seal coat for this job consisted of ½-inch or pea stone spread with a Handy Sandy machine over the entire width of the pavement and rolled in with a heavy roller. This gives a harder and grittier surface than the sand mixture alone and offers an effective check to skidding which is so common in wet weather on smooth top pavements of either concrete or asphalt construction.

SHOULDERS AND CURB

On level grade and on fills the shoulder was carried 3 feet wide on both sides of the pavement which was 24 feet wide. In cuts there was no shoulder nor ditch but a concrete curb of precast slabs was used. These slabs were 3 feet long, 4 inches thick, and 16 inches high, and were set 8 inches above and 8 inches below ground. In cuts the road was made 30 feet wide. The edging was provided by the Nelson Concrete Works, Quincy, Mass.

PERSONNEL

This work was built by the Lane Construction Co. of Meriden, Conn., for whom A. C. Woodhouse was Superintendent. W. R. Smith, President of the Lane organization, was President of the American Road Builders Association last year. For the State Department of Public Works, Ernest Hosback was Resident Engineer.

Labor Receives Large Share of Cost of Concrete Pavement

ABOUT nine-tenths of every $1,000 received by the contractor in building a concrete pavement is ultimately paid out either directly or indirectly in salaries and wages, according to Thomas H. MacDonald, Chief, U. S. Bureau of Public Roads, in testifying at the hearings of the Senate Committee on Appropriations. This statement, which is the result of an extensive study of all costs of building concrete pavement, was a part of Mr. MacDonald's testimony showing the value of road building in providing work for the unemployed. Mr. MacDonald explained, "The fact that so much of the road dollar goes into labor either directly or indirectly is due to the fact that there are no intrinsically valuable materials used in road building."

The data presented by Mr. MacDonald showed that of the $1,000 given to the contractor for building concrete pavements $141 is spent directly by him for labor on the job. An additional $44.70 is spent for labor by him in getting on the job and for other miscellaneous items. The contractor pays mills and quarries $675 which along with $139.30 spent by the contractor through other agencies is distributed so that labor eventually receives about $900 from each $1,000 spent in the construction of concrete roads. This money is expended for wages in mills and quarries, transportation, the production of fuel, the manufacture of supplies and equipment, etc.

The Leipzig Trade Fair

FREE trips to the Leipzig Trade Fair, which will be held from August 28 to September 1, are again offered to American buyers throughout the country. This plan for defraying the cost of the trip has proved very popular, the expense of the round trip being refunded at Leipzig on the basis of orders placed at the Fair.

The Fair this autumn will include some 8,000 exhibits of the newest products contributed by 25 countries. Some 125,000 buyers and exhibitors from every quarter of the globe are expected to attend, of which 17 per cent will be from countries outside of Germany, including of course the United States. Detailed information may be obtained without obligation from the Leipzig Trade Fair, Inc., 10 East 40th St., New York.

How the Other Fellow Did It

Construction Briefs

Adjustable Handles a Novelty on Longitudinal Floats

163. The heavy longitudinal floats used in many states are almost invariably equipped with plow handles at each end for their manipulation. One contractor whose work was visited last summer showed a remarkable appreciation of the fact that the men who would operate the float during the season might vary from the sizes of Tom Thumb to the Cardiff Giant and that neither might be able to handle the float with a minimum of effort if the handles were set at one average height. The picture below shows the way he overcame this and can vary the height of the handles for the different laborers. The float is shown on one side of the rolling bridge. The strap iron supports for the handle are shown quite clearly. Holes punched at about 2-inch intervals permitted the tie rod to be put through at different elevations raising or lowering the plow handles which are bolted through the top beam of the float at the lower end of the handle.

Adjustable Handles on a Bull Float

Attention might also be called to the way one of the laborers takes care of his spare shovel by pushing it under the bridge between the planks and the tie rods of the near end of the bridge. No one was going to fall over that shovel, although they might trip over the one laid on top of the plank. A thought for the safety of highway laborers saves many injuries. 24.3.28

Keeping Excess Asphalt Off the Surface of Brick Pavement

164. Many contractors have experienced difficulties when filling the joints of brick pavement with asphalt to prevent an excess of the filler material on the surface of the pavement. On a job in northern New York State, when the filler work was started, it was found that after the first passage of the squeegee buggy the joints were not properly filled. Hand squeegees and buckets were used to complete the filling, but after this operation an excess of asphalt remained on the top of the bricks. This condition was not satisfactory so it was necessary for the contractor to do some experimenting. He found that passing over the brick twice with the squeegee buggies gave first rate results. It was necessary to allow enough time to elapse between the first and second applications so that the first application would pass the sticky stage. The joints were then well filled without an excess on the surface. About ¾-gallon of asphalt per square yard of pavement was applied. 22.1.89

Safety, Convenience and Common Sense at a Crusher

165. At most quarries set up commercially considerable attention is paid to the safety of the operators, but unfortunately in the thousands of quarries opened up each year on road jobs many contractors pay little or no attention to safety and convenience. In one temporary quarry, visited in West Virginia, the contractor took particular pains with the set-up. The chute on which the shuttle truck dumped to the crusher was covered with a metal plate to save the wear on the wood. The two men feeding the stone to the crusher were protected by a heavy wooden wall in front of them and a heavy hand rail behind them. All of the ladders about the screening plant were of heavy, solid construction which left no excuse for accidents. 22.2.78

Doubling Up the Road Forms on a Widening Job

166. On a West Virginia road contract where an old 18-foot brick road was resurfaced with concrete and widened to 20 feet, the work being done in two 10-foot strips, it was necessary to use 14 inches of forms on the outer edges of the pavement where there were superelevated curbs. This was accomplished by doubling the road form height through the simple procedure of setting one 7-inch steel road form on top of another and staking both forms at the same time with the same stakes. This was possible because the stake pockets lined up perfectly and presented no obstruction to the staking operation. The half-width construction method necessitated that the inside road forms be set in the middle of the old brick road and jack hammers were used to drill the holes for the road form stakes. 23.1.91

No Splashing or Blowing of Asphalt at This Plant

167. Various devices have been conceived by superintendents to insure the delivery of all of the asphalt from the pipe leading from the heating kettle to the weigh bucket on an asphalt plant. Asphalt blown from the hot stream is dangerous to the men, wasteful of the material itself and does not add to the appearance of a plant. One contractor affixed a light sheet metal cover on the weigh bucket with a hole in the top of it slightly larger than the delivery pipe. This worked quite well. Another, a New England contractor, had a plant which was equipped with the standard weigh bucket on an overhead trolley which was run back and forth to the asphalt valve where it was filled and weighed and then run forward and emptied into the pug mill. This superintendent put a compressed air valve and a piston on the bucket so that by pushing the valve the bucket would be run back and forth without tiring the operator. On another plant of this same company, the bucket remained stationary above the pug mill and the operator only opened a valve to fill the bucket to the required weight. A pump circulated asphalt from the heating tank through a loop of pipe with a valve on a 3-foot nipple leading to the bucket. The pump simply circulated the asphalt around the loop until the valve was opened and then the asphalt flowed along the path of least resistance and into the bucket. This very simple scheme speeded up the operations at the plant considerably. 22.1.84

The Editor Comments—

The Contractor—His Business Magazine—and the Advertiser

In times of economic stress, more than at any other period, it is essential for the component parts of the construction industry to operate as a unit: contractor, the contractor's magazine, and the advertiser.

The contractor is faced with lower unit prices for his work, making necessary a closer scrutiny of his operating costs, the adoption of more economical methods and greater care in the selection and maintenance of his equipment, a wider knowledge of which may be gained from the careful reading of a magazine edited for him.

The articles in CONTRACTORS AND ENGINEERS MONTHLY, the contractor's magazine, are secured by its editor, not from his desk but in the field after examination of well-operated jobs and conferences with the contractors and engineers for the work. It is the leading magazine published for contractors with their interest foremost. Regular readers examine the book from cover to cover, gleaning new ideas from advertising and editorial pages alike.

The advertiser is the financial backer of any paper. CONTRACTORS AND ENGINEERS MONTHLY, the business magazine of the civil engineering contractor, is no exception. It is the manufacturer whose investment in its advertising pages makes possible travel and the investigation of construction projects, and the presentation of the most up-to-date methods and equipment to our readers.

Contractors who appreciate the value of the editorial and advertising pages of this magazine can perform a distinct service to the construction industry by giving special attention to the advertisements in each issue and mentioning CONTRACTORS AND ENGINEERS MONTHLY to each maufacturer with whom he does business.

Just as we keep faith with our readers, so do we hope our readers will justify the confidence of advertisers in us.

English and American Contractors Compared

Recently a complimentary dinner was given by George W. Fuller, Consulting Engineer, New York City, for John D. Watson, Consulting Engineer of Birmingham and Westminster, England. On the previous day Mr. Watson had visited the Wards Island activated sludge sewage treatment plant now under construction to treat the sewage of a portion of New York City. Mr. Watson reported that somewhat similar work is underway for a group of cities and counties above London on the River Thames and that the work is being financed largely by an unemployment grant of the British Government amounting to as much as 50 per cent of the total cost of the project. Mr. Watson stated that if the English contractors used as efficient methods of construction as does the American contractor, it would be easily possible for the project to earn all of the unemployment grant but that the time limit on the grant will undoubtedly be reached before the project can be completed by the present methods employed.

Toy Equipment for a Man-Sized Job

Low bidding is leading to some peculiar conditions. A reputable contractor well-known for his concrete and sand-asphalt construction went out of his field, both in type of work and territory, and bid a gravel surfacing job—cheap. He hired a gas roller that spluttered more than it ran, and subbed the hauling of the gravel from the pit to the road. To get rid of the large-sized stone that ran as large as a man's head he first installed a sloping screen that required the trucks to back up an incline a distance of 60 feet at least. The screen would not produce gravel as rapidly as wanted so another scheme was tried. A circular screen was installed at the top of the bin and a bucket elevator rigged to raise the pit-run material to the screen.

All of us have gazed in toy shop windows and seen the Buddy construction toys, and some of us regretted that they were non-existent 40 or 50 years ago. The bucket elevator that the contractor was trying to use on this job was in the toy class. Further it had a faculty of kicking out most of the material fed to it until one was forced to recall the famous frog that was trying to jump out of the well and fell back two feet for every three he jumped up. The elevator was obviously not the piece of equipment for that job. It was too light to handle the cobbles that ran rather high in the pit-run material. It was too slack and ran off the track every minute or two.

The job was bid too cheap to buy new equipment; it was bid too cheap to afford to ship the contractor's own good equipment from his home state; and the superintendent, a good man, knew that he had to get along with cheap equipment which he might pick up locally and try to get by. Why must we be faced continually with this situation? We cannot say in this case that the contractor should be classed as irresponsible, but rather he, like many others, has become hysterical and is looking for anything at any price. Now stop a minute and take stock. What will become of the contracting fraternity, a real brotherhood of men who have brains and who are willing to gamble that their methods are a little better than the other man's, if they acquire that feminine weakness, hysteria.

When you gamble, stay in your own field, play with the stakes you know, bid as low as you feel necessary, but know what you are doing. Keep away from trying to do something you know nothing about just for the sake of looking busy.

Theodore Reed Kendall

Legal Points for Contractors

These brief abstracts of court decisions in the contracting field may aid you in avoiding legal difficulties. Local ordinances or state laws may alter the conditions in your community. If in doubt consult your own attorney

Edited by A. L. H. Street, Attorney-at-Law

Insistence on Fraud Excuses Repudiation of Agreement

"Although I've entered into this contract with you to build a house for me for $24,750, I can't let you go ahead with the work unless you sign a building contract showing that the price is to be $35,000," said the owner to a Massachusetts contractor. "I need such a paper to enable me to borrow more money on the property than I can borrow if the lender knows that the house is only costing me about $25,000."

"Nothing doing," replied the contractor. "Sorry but I can't be a party to helping you 'flim-flam' the lender."

Later the owner sued the contractor for damages for failing to carry out the original contract, but the Massachusetts Supreme Judicial Court decided in an opinion filed September 11, 1930 (Ragan v. Dyer, 172 N. E. 597), that the contractor was excused from performing the agreement. The court said:

"If, as the jury could have found, the plaintiff refused to carry out the agreement unless the defendant would enter into a fraudlent contract as testified to by the defendant, the jury would have been justified in finding that the defendant was excused from performance. He could treat the contract as rescinded and at an end."

Malicious Bankruptcy Proceedings Against Contractor

Our attention has been drawn to a case where business enemies of a contractor induced creditors of the contractor to turn over to them claims for collection, and then filed bankruptcy proceedings against him. When the time for the hearing on the petition arrived, these parties did not appear. It does not appear whether or not the bankruptcy proceeding has been dismissed. But the contractor's credit and business has been ruined by the publicity given in the newspapers and elsewhere to the bankruptcy proceeding.

There can be no doubt but that contractors who are unjustly attacked in this way have a heavy damage claim against the wrongdoers. But, to establish such a claim, it must appear that the bankruptcy proceeding was filed without probable cause. That means that there must be not only a dismissal of the proceeding, but also proof that there was no reasonable ground for having instituted it. In holding that malicious filing of a bankruptcy petition, without probable cause, was actionable, the Illinois Supreme Court once said (130 N. E. 791, 792):

"A petition in bankruptcy * * * is most far-reaching and drastic in its effects. Whether the property of the bankrupt be actually seized or not, no prudent person will buy from him or sell anything to him on credit."

But if one is insolvent and subject to bankruptcy proceedings, the mere fact that creditors, or their agents, may maliciously do what they could do without malice—file bankruptcy proceedings—will not make them liable.

Because wrongdoers are often judgment proof, it is interesting to consider what can be done toward criminal prosecution in cases of this kind. If a false oath is made in a bankruptcy proceeding it will sustain a prosecution for perjury. And it seems quite clear that if two or more persons conspire to unjustly injure another by ruining his credit they are guilty of a criminal conspiracy.

But the contractor should be cautious about preferring criminal charges, to avoid the risk of the person or persons complained of coming back with a suit for damages for malicious prosecution, in case the charges should fail in court. No criminal charge should ever be filed unless there is reasonable ground for believing it to be true nor without first disclosing all the facts to the prosecuting attorney and taking his advice on the point as to whether or not those facts are sufficient to justify prosecution.

Contractor's Liability to Third Persons for Defects in Work

Any contractor who either willfully or negligently leaves in a job done by him a defect that is apt to cause injury is leaving a germ that may spell a lot of trouble for him after he has forgotten all about the work. Some third person may receive an injury and secure a money judgment against the contractor far in excess of his gross receipts from the job. It is well to remember what the California District Court of Appeal said in the case of Dahms v. General Elevator Co., 1 Pac. 2d, 446, decided June 30, 1931:

"Generally, an independent contractor employed to do given work is no longer liable to third persons for injuries received because of his negligent performance, after he has completed the job and it has been accepted by his employer. To this rule certain exceptions exist of which the following only is here applicable: The contractor continues liable where the work performed is not imminently dangerous in kind, but is rendered dangerous by defect."

How Much Should a Contractor Pay for Unauthorized Quarrying of Materials?

"Judge, this contracting company took 12,000 yards of rock off my place for use on that road job nearby, without my consent," complained a New Yorker named Rock. "The rock removed was worth $12,000 and I want $36,000, because the laws of this State say that a willful trespasser must pay treble damages."

"Plaintiff's claim is just $35,975 too high," contended the contracting company. "He sold an acre of his land, including a portion of this same rock ledge to the county for $50. At the same rate, we owe him $25."

"You're both away off in your figures," said the Washington County Supreme Court (252 N. Y. Supp. 463). "$1,800 is what you must pay, Contracting Company."

The reasoning of the court amounted to this: The contracting company ought to have known that it was trespassing on the plaintiff's land. But the evidence showed that the plaintiff knew all the time that the rock was being removed and did not forbid continuation of operations. Under such circumstances the plaintiff was merely entitled to the value of the stone in place, and his own expert witnesses had put that value at 15 cents per yard.

The Consulting Engineer

Malcolm Pirnie, Consulting Engineer, New York City, addressed the members of the American Forestry Association at their 57th annual conference which was held in Baltimore last month. His subject was the growing demand of urban population upon eastern water sources. He also discussed the present need for a public works program and read the statement released Thursday, May 12, 1932, by the American Society of Civil Engineers entitled, "A Normal Program for Public Works Construction to Stimulate Trade Recovery and Revive Employment."

J. J. Del Bourgo, C. E., 920 Broad St., Newark, N. J., has announced an engineering service especially suitable for contractors. While many large contracting firms have one or more engineers on the staff or as a member of the company, many smaller firms do not have an engineer in their regular employ. To these contractors, such a consulting engineer service can render valuable assistance. Mr. Del Bourgo is prepared to make a survey of the project, estimate the quantities involved, prepare the bid, supervise construction and make a final check with the owner's engineer when the job is completed. In this way, the contractor can avail himself of the services of a consulting engineer at a low fee and also have the benefit of an expert outside engineer on his job and thus not only profit themselves but also do the best possible work for the owners.

Hollister Engineering Co., Lincoln, Nebr., has completed accounting reports for David City and Seward, Nebr. C. D. Bullock has recently joined the staff as Assistant Engineer.

C. E. Smith & Co., Railway Exchange Bldg., St. Louis, Mo., recently completed the foundation plans for the St. Louis Union Depot approach to the St. Louis Municipal Bridge and have in preparation the steel plans for this approach and the track construction plans for the Municipal Bridge and approaches. The erection of the steel for the East St. Louis Union Station approach to the St. Louis Municipal Bridge and the earth embankment is going on under the supervision of this firm. They are also making an inspection of 3,500,000 feet of long leaf yellow pine at the mills in Alabama. C. E. Smith & Co. are representing the City of St. Louis in the rate and valuation case on the property being devoted to the manufacture and distribution of a mixture of manufactured and natural gas.

Henrici-Lowry Engineers, Kansas City, Mo., are preparing plans for a new design of an industrial plant, making load and power consumption studies and planning two installations of large elevators. The construction of a water softening plant for the entire city of Marshall, Mo., extension to the water mains, Chillicothe, Mo., and several other public utilities in various stages is going on under this firm's supervision. This company is acting as expert witness in the condemnation suit of the Union Power Co. vs. H. Youngs of Missouri and of the Ozark Power & Dam Co. of Missouri vs. B. S. Beers.

Moran & Proctor, Consulting Engineers, New York City, have changed their office address from 342 Madison Avenue to 120 East 41st Street.

The J. N. Chester Engineers, Pittsburgh, Penna., are engaged at the present time in carrying on extensive improvements for the water and sewer departments of Lancaster, Penna., where contracts to the amount of $2,000,000 have been let for improvements, including a 16,000,000-gallon rapid sand filtration plant, a 5,500,000-gallon standpipe, more than 15 miles of sewers, water lines, the raising of a dam and sewage pumping stations. Plans are now being prepared for two sewage treatment plants for Lancaster, each having a capacity of 6 mgd and each of the activated sludge type.

Other projects include the design of a comprehensive sewer system and sewage treatment plant for Bowling Green, Ky.; supervision of construction at the Nashville filtration plant which is being enlarged from 28 to 42 mdg., and to which an aerator system is being added; the design and construction of a 50,000,000-gallon concrete-lined reservoir for the Torrence, Penna., State Hospital; the design of a complete power plant for the Rockview, Penna., State Penitentiary; the design for extensions of the present sewage treatment works at the Polk, Penna., Institution for the Feeble Minded and appraisals of the Kensington Water Co. properties at New Kensington, Penna., and the Tri-Cities Water Co. properties at Charleroi and Monessen, Penna.

C. A. P. Turner, 342 Builders Exchange, Minneapolis, Minn., recently delivered a lecture before the mechanical engineers of the University of Minnesota on the subject "Mechanics of Elasticity and Strength of Metals Calculated from the Thermo Dynamic Equations of Energy and Molecular Vibration".

Blum Weldin & Co., 417 Grant St., Pittsburgh, Penna., is at present preparing plans for the development of a summer camp for the Methodist Episcopal Church Union. This company recently acted as expert witness in the Duquesne Light Co. vs. Westmoreland Brick Co. case in regard to the condemnation of pillars in a clay mine.

R. Husselman, 310 Hippodrome Bldg., Cleveland, Ohio, is preparing reports for Oberlin and Crestline, Ohio, and an appraisal of electric property for Orrville, Ohio, as well as supervising the construction of an extension of the electric generating plant for Willard, Ohio. Mr. Husselman recently appeared as expert witness in the Grove City, Penna., et al vs. Union Heat & Light Co. gas rate case and in a case of a taxpayer vs. Board of Public Affairs, Orrville, Ohio.

W. W. McClendon, Corsicana, Texas, recently acted as expert witness in the case of Albritton vs. City of Corsicana for damages from the operation of an incinerator plant. Mr. McClendon is supervising the construction of twenty-five blocks of concrete paving, 3 miles of 6-inch sanitary sewer and 1 mile of 24 to 36-inch storm sewer for the City of Corsicana.

Pittsburgh Testing Laboratory, Pittsburgh, Penna., has announced the return to its staff of P. J. Freeman as Consulting Engineer. Mr. Freeman, who has for many years been Chief of the Bureau of Tests and Specifications of the County of Allegheny, Penna., will specialize on problems relating to municipal construction, roads and pavements, technological control of concrete production and placement, and special investigations.

Construction Industry News

The Asphalt Institute, 801 Second Ave., New York City, has announced that New Orleans has been chosen by the Institute for the Tenth Annual Asphalt Paving Conference to be held in the week of December 5, 1932. The program, in recognition of present economic conditions, will be devoted largely to phases of low-cost road construction. The Association of Asphalt Paving Technologists will, as usual, meet in conjunction with the paving conference. William H. Kershaw of The Texas Co. is President of The Asphalt Institute with C. W. Bayliss, Barber Asphalt Co.; B. L. Boye, Standard Oil Co. of New York, and J. A. Blood, Standard Oil Co. of California, Vice Presidents; J. S. Helm, Standard Oil Co. of New Jersey, Chairman of the Executive Committee and A. M. Maxwell, Standard Oil Co. of Ohio, Secretary.

The McDonald International Corp., 381 Fourth Ave., New York City, has been formed to carry on highway and other contract work abroad with William P. McDonald, President, Job H. Lippincott, Vice President and Manager and Charles M. Upham, Engineer-Manager, American Road Builders' Association, as Consulting Engineer. Mr. Lippincott was formerly Vice President of the Warren Brothers Co., Boston, Mass., in charge of foreign business.

The Moon Track Co., Chicago, Ill., has announced its merger with Pettibone Mulliken Co., 4710 W. Division St., Chicago, Ill., steel casting manufacturers, to form an Industrial Equipment Division. R. W. Moon, Vice President and Sales Manager of the Moon Track Co., will be Sales Manager of the new division. Associated with Mr. Moon will be G. C. Salisbury and E. C. Myers, of Milwaukee.

Stephens-Adamson Mfg. Co. of Canada Ltd., Belleville, Ont., manufacturers of conveyors, has concluded an arrangement with the Orton Crane & Shovel Co., Huntington, Ind., for the manufacture and exclusive sale in Canada of Orton locomotive cranes, dipper shovels, pull back ditchers, skimmers, clamshell buckets, orange peel buckets, traveling gantry and cantilever cranes and similar equipment. This equipment will be known as the Saco-Orton line. The factory of the Stephens-Adamson company is located at Belleville, Ont., and the sales and engineering offices are located at 926 Bank of Hamilton Bldg., Toronto, and 220 New Birks Bldg., Montreal.

Carnegie Steel Co., Pittsburgh, Pa., has announced the retirement of Charles C. Cluff, Manager of Sales of the New York District, after more than fifty years in the steel business. He is succeeded by James R. Mills who has been Manager of Sales at Cleveland, Ohio. Mr. Mills is succeeded at Cleveland by Francis C. Hardie who has been Assistant Manager of Sales of the Illinois Steel Co. at Chicago.

Sterling Motor Truck Co., Milwaukee, Wis., has announced that negotiations have been completed for the acquisition of the motor truck division of the LaFrance-Republic Sales Corp., Alma, Mich. It is understood that net current assets, free of liabilities, acquired by Sterling in the transaction exceeds $1,000,000.

The Young Radiator Co., Racine, Wis., announces the appointment of L. M. Young as Works Manager in charge of the manufacturing plant and of development work covering both the Engine Cooling Division, comprising the manufacture of radiators for trucks, tractors, industrial power units and diesel engines, and the Heating Division, covering the manufacture of car heater core and tank assemblies, unit heaters, Streamaire copper convection heaters, cabinets and enclosures as well as evaporators, condensers, precoolers and preheaters for air-conditioning systems.

Universal Atlas Cement Co., Chicago, Ill., has announced that F. L. Stone, General Sales Manager and Paul C. Van Zandt, Assistant to the President in connection with operations and engineering, have been elected vice presidents of the company at a recent meeting of the board of directors.

The Equipment Distributor

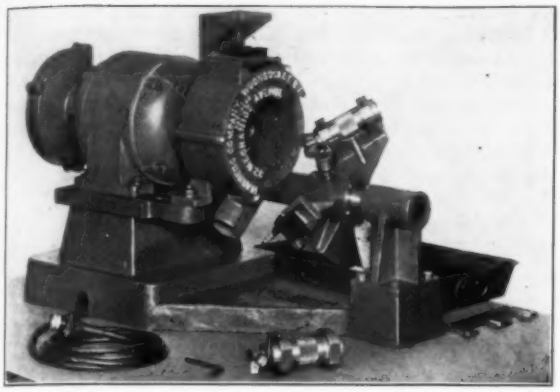
Harry P. Usher, formerly President of Smith Booth Usher Co., Los Angeles, Calif., passed away on June 7. Mr. Usher was well known in the construction equipment field and his death is a great loss to the industry.

J. F. Murphy, 2400 Faxon Ave., Memphis, Tenn., has recently been appointed distributor by the Link-Belt Co., Chicago, Ill., for its line of shovels, cranes and draglines in the Memphis district.

Coast Engineering & Equipment Co., 420-422 East Eighth St., Los Angeles, Calif., has recently been formed by Dan R. Brown and J. Royden Estey to engage in engineering and the engineering sales of heavy-duty construction and building equipment, representing a very limited number of accounts requiring technical sales work. Mr. Brown is well known in the equipment sales field on the Pacific coast, having been for the past 15 years President of the Brown-Bevis Co. and director of the Herbert Machinery Co. Mr. Estey is a graduate engineer from McGill University and during the past 8 years has been active as a consulting and sales engineer in the Southern California district.

McLaughlin Mill Supply Co., 534-536 Michigan St., Hammond, Ind., will be known from now on as the **Standard Equipment & Supply Corp.**, successor to McLaughlin Mill Supply Co., and will continue to carry the same complete line of equipment as heretofore.

Rolling Black Base with Tandem Rollers



The Marberg Grinder for Detachable Bits

A Detachable Bit Grinder

THE many advantages of the detachable bit have resulted in the adoption of these rock drilling tools where the older and larger rock drills would prove cumbersome and less economical. The original intention of the detachable bit manufacturer was that the bits should be sold inexpensively enough to permit throwing them away when they had drilled as far as possible. This arrangement proved satisfactory, eliminating the cost of purchasing and transporting the longer pieces of drill steel and maintaining a blacksmith shop to sharpen the steel.

Now a new unit for sharpening detachable bits which reduces drilling costs still more has been announced by the Marberg Co., 32 Mechanics Ave., Woonsocket, R. I. This Marberg bit grinder, the operation of which is very simple, restores the bit to its original form and makes it possible to use the same bit a number of times, depending upon the wear caused by the hardness of the rock being drilled. The manufacturer states that it has been found perfectly feasible to regrind to half gages.

The Marberg bit grinder is as light as is consistent with modern machine design and is readily portable. It can be transported in the back of any car and can be set up in tunnels, shafts, quarries or any place where the operator has elbow room and there is an electric line suitable for lights. The motor comes within the legal requirements for use on any ordinary light line of 110 or 220 volts, alternating current. Direct current motors can be furnished at a slight additional cost.

According to the manufacturer, the average cost per sharpening of bits is 5 cents while the use of this grinder cuts old method costs from 60 to 75 per cent.

A Portable Air Compressor for Tractor Mounting

THE Davey vertical, two-cylinder, air-cooled compressor, made by the Davey Compressor Co., Inc., Kent, Ohio, has recently been adapted for mounting on the Model 15 Cletrac tractor, a product of the Cleveland Tractor Co., 19321 Euclid Ave., Cleveland, Ohio. This compressor provides a flexible combined unit whereby utilization of the compressor is available in a very convenient form and does not interfere with the other uses of the tractor for pulling purposes.

The Davey mounting is carefully designed in all details to work properly with the tractor. The location is such that maximum accessibility and convenience in operation is provided and the drawbar is entirely clear for all operations of the tractor. The light weight of the compressor unit, which is 890 pounds, does not affect the tractor balance. The compressor drive is through the rear power take-off, employing heavy alloy steel drive shafts, and only one spur gear reduction, minimizing power loss between the tractor engine and the compressor. A special heavy-duty ball bearing provides ample bearing capacity for the driving sheave and a conveniently located clutch permits the starting and stopping of the compressor at will.

A New Shunt for Enamel Wire Electric Blasting Caps

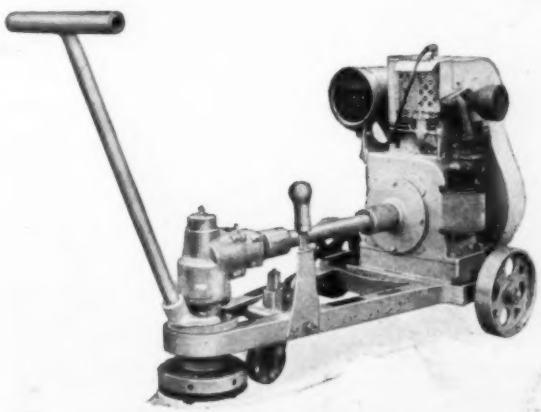
THE adoption of a new shunt for enamel wire electric blasting caps has been announced by Hercules Powder Co., 915 King St., Wilmington, Dela. The new shunt is called the "Wassen" and is made by winding the end wires around a small piece of metal. It is as effective as the old type of twisted ends, and is easier to untwist and take apart without distorting the wires. For electric caps with plain iron or copper wires, Hercules will continue to use the eyelet shunt which has been found practical and satisfactory by blasters.

The shunting of blasting cap wires is important to safety in blasting operations because it prevents accidental explosions from loose wires coming in contact with a source of electric current, according to the Technical Service Division of the Hercules Powder Co. Special care should be exercised when using enamel wires and particularly wires that have been cut shorter as all the enamel should be carefully scraped off the ends when hooking up so as to prevent misfires.

A New Surfacer for Concrete and Concrete Asphalt Paving

A NUMBER of improvements in the designs and construction of the new Model H-6 Berg Hi-Way surfacer is announced by the manufacturer, the Concrete Surfacing Machinery Co., 4559 Spring Grove Ave., Cincinnati, Ohio.

Larger areas of concrete and concrete asphalt paving can be surfaced per hour than was possible with the older type machine. The cutters, because of the rotation and speed of the cutter plate and the improved method of milling and hardening, now last much longer. The engine is mounted directly over the rear axle, making handling easier. The heavy frame causes the cutter plate to hug the surface and reduces the vibration and fatigue to the operator to a minimum. The 3-horsepower Wisconsin engine is equipped with a new carburetor for quick starting and an Air Maze filter.



The New Berg Hi-Way Surfacer

A New High Compression Engine

The Novo AG Rollr Engine

A NEW 2-horsepower high compression engine, a single cylinder vertical type unit, has been announced by the Novo Engine Co., 216 Porter St., Lansing, Mich. This AG Rollr unit is particularly adaptable to small jobs such as the running of saw tables, light plants, spray rigs, etc. Two Timken roller bearings are used on the crankshaft, and two on the powershaft. The cylinder block contains a high percentage of steel as well as chromium and nickel which give a close grained metal of high transverse strength. The oiling system is composed of a dipper on the connecting rods which picks up the oil from the bottom of the crankcase and distributes it to the bearings, gears, piston, connecting rods and all working parts within the engine.

A speed reducing transmission is built into the AG Rollr engine eliminating a speed reduction outside of the engine. This integral transmission drops the 1,200-rpm engine speed down to 600-rpm pulley speed. It is equipped with an enclosed, adjustable, self-oiling fly-ball governor which maintains the rated crankshaft speed at all loads. The crankshaft is precisely counterbalanced and eliminates vibration. This engine is designed for ready portability and weighs only 150 pounds.

A Special Machine for Dragline Work

ONE of the features of the new 45 dragline recently announced by Bucyrus-Erie Co., South Milwaukee, Wis., is the long tapered crawler-type mounting which enables it to work on and cross soft ground easily and without nosing in. These crawlers are 19 feet 6 inches long and in design follow closely the type used on the Class 9½ dragline. The new mounting gives low ground pressure, has high clearance under the frame and propels easily even in heavy mud.

The 45-B may be equipped with a 50-foot boom and a 2 to 2¼-yard bucket, depending on the weight of the bucket, the material being handled and the working radius, or a 1¼ to 1½-yard bucket and a 65-foot boom. Booms may be secured up to 80 feet long. The machine is equipped with a 155-horsepower six-cylinder engine. The boom is of strong but light-weight design and is built of alloy steel. It has large fairlead sheaves which cut down rope wear. The machine steers like a tractor, through clutches controlled by a lever at the operator's side. It is not convertible to a shovel but it may readily be used for clamshell or crane service.

The New Bucyrus-Erie 45-B Dragline

Twin-Cylinder Hydraulic Bulldozers

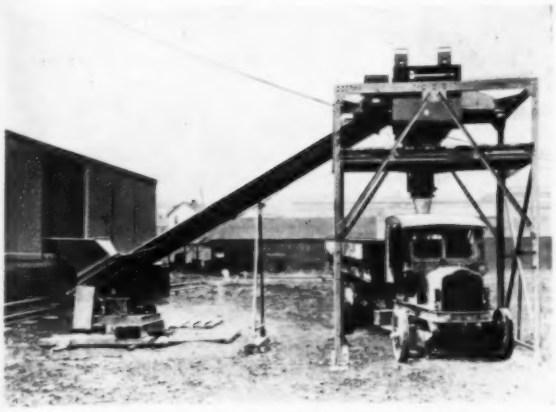
A LINE of twin-cylinder hydraulic bulldozers, Models 51, 51A and 54 for Caterpillar tractors and Models 52 and 55 for Allis-Chalmers tractors, are made by the Baker Manufacturing Co., 585 Stanford Ave., Springfield, Ill., for use in earth moving, spreading and backfilling jobs of all kinds.

The moldboard is raised and lowered by means of two bell cranks of cast steel, one on each side. Each crank is clamped to a nickle-steel axle mounted on Timken roller bearings and set just above the push member. Over each axle, an arm is clamped to which connection is made, through a clevise, with the end of the cylinder ram. One end of the bell crank is free, resting and revolving on a saddle bolted to the track frame at a point near the center of the tracks, this practically eliminating side draft on the tracks. The two cylinders, one on each push member, are connected, causing the load to be equalized and the weight evenly distributed. The action of the ram revolves the crank to raise or lower the moldboard.

The Baker Twin-Cylinder Hydraulic Bulldozer

The range of lift on the Model 54 bulldozer for the Caterpillar Sixty is 37 inches, making it adjustable to cut 11 to 14½ inches below the ground level and 22½ to 26 inches above. Model 51 for the Thirty has a lifting range of 28 inches which can be divided to cut as much as 10 inches below ground level, in which case it will lift 18 inches off the ground. The Model 55 for the Allis Chalmers Model L tractor has a range of lift of 37 inches and Model 52 for the Allis-Chalmers Model 35 has a lifting range of 30 inches, cutting 10 inches below ground level and 20 inches above.

Attachment to the tractor is made on the frame in line with the axle of the tractor and the push members are hinged at this point, thus permitting the moldboard to float freely on the ground, independent of the motion of the tractor. The moldboard is of heavy bulk-head construction, with a separate replaceable cutting edge bolted to it. The entire moldboard assembly can be removed in 30 minutes' time by simply taking out the bolts in the flanges of the stub beams.



The Blaw-Knox Handy Bulk Cement Plant

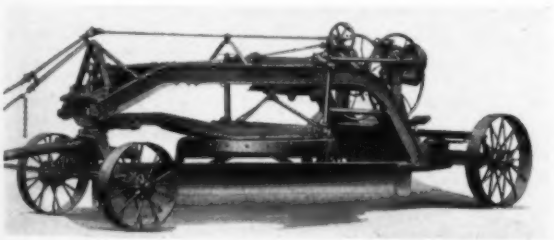
A New Portable Bulk Cement Plant

A NEW development for contractors who want to benefit by the economies of using bulk cement has recently been announced by the Blaw-Knox Co., 2067 Farmers Bank Bldg., Pittsburgh, Penna. On this Handy bulk cement plant, no bin is required. The hinged car hopper is adjustable to car height for the use of either buggies or scoop shovels. A 4-cylinder engine operates the enclosed screw conveyor which loads a 1,000-pound double beam cement weighing batcher. This batcher is equipped with springless dial indicators which show when the batcher is full or empty. A canvas chute controls the discharge into truck compartments. The entire plant is easily portable.

A New Heavy-Duty Leaning-Wheel Grader with 12-Foot Blade

A NEW heavy-duty grader of the leaning-wheel type, designed for use with the Caterpillar Fifty tractor, has recently been announced by Caterpillar Tractor Co., Peoria, Ill. This Caterpillar Fifty grader has a 12-foot blade which can turn power at the drawbar into many yards of earth moved per day, a blade range that gives a side reach of 62 inches outside of the rear wheels for shoulder work when the standard blade is set at a 45-degree horizontal angle and still greater reach with the blade extensions. Its flexibility allows bank cutting 9 feet high at an angle of 20 degrees off perpendicular.

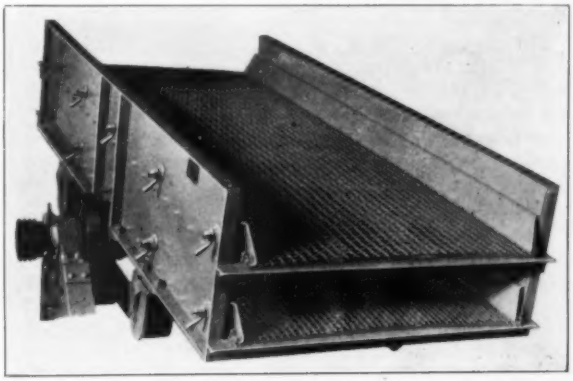
The entire lifting mechanism is mounted on anti-friction bearings; the lift arms, shafts and important forged parts are heat-treated; the bronze lift gears are adjustable to six points of wear and it has extensible lift links with ball-and-socket connections and shims for take-up. It has axle spindles of chrome nickel heat-treated steel, tapered roller bearings, cork seals and metal guards in all the wheels.



A Heavy-Duty Grader with a 12-Foot Blade

New Heavy-Duty Vibrating Screens

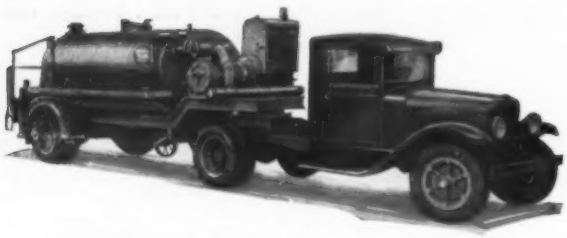
TWO new types of vibrating screens have recently been announced by the Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia, Penna. These screens are known as the Link-Belt positive-drive-type vibrating screen, which is made with both single and multiple decks, and the Link-Belt unbalanced-pulley-type, also made with single and multiple decks. The positive-drive-type can be furnished to provide any given fixed amplitude, with shaft speeds to suit. The amplitude of vibration is fixed at the factory, to suit the work the screen is to do. Any given amplitude will cover a wide range of screening surface openings. The angle of the screen inclination, the speed of operation and the direction of the rotation are readily changed at any time to suit the kind, size and condition of material to be screened. The rotation determines whether the vibrations are with or against the flow of the material. The double deck model of this type provides accessibility to the screen cloths, which are placed under tension crosswise by side tension members which also serve as wearing plates and prevent material from leaking along the edges. Only the screen cloths need to be removed when replacements are required.



The New Link-Belt Double Deck Vibrating Screen

Cantilever leaf springs serve to maintain the screen box at a constant angle, being adapted for the circular motion produced by the action of the eccentric-driven positive drive. Oversize self-aligning spherical roller bearings are used. A steel subframe is regularly furnished as a part of the screen, and it can be supported from below, or hung by cables from above.

The unbalanced-pulley-type heavy-duty screen is available with single or multiple decks for high speed work where the material is of a sticky nature and on close-sizing problems where the screen openings are not large. The total movement or amplitude of the screen can be varied by the user from 0 to about ¼ inch by simply changing the counterweights in the weight containers, a convenient feature where screen cloth openings must be changed frequently and when the condition of the material handled is likely to vary as to moisture content, etc. The angle of the screen and the speed and direction of operation can also be changed readily by the user to suit operating conditions. The entire weight of the screen box rests on the cantilever leaf springs and responds to the reactions therefrom. The bearings, the method of applying screen cloths and the cantilever leaf spring design are the same as on the positive-drive-type screen described above.



The New Rosco Bituminous Distributor and Oiler

Asphalt and Oil Distributor with New Features

THE Rosco bituminous distributor and oiler made by the Rosco Manufacturing Co., Minneapolis, Minn., has a number of new features including the seven-way valve which directs the flow of material in three ways: in loading the tank, in circulating the material when idling or heating, and in taking the material from the tank to the spray bar. This valve has two suctions and two discharge openings which are controlled by one lever. The valve gear rotary pump and power plant are mounted on a semi-steel machined base immediately back of the driver's cab.

The spray bar is made up of multiple sections and is dead ended at the center point. The outside section folds back out of the way when not in use or is adjustable so that distribution may be obtained at various angles. A hand spraying attachment is available for patching jobs. The hose is attached to an opening on the upper cross-pipe section of the spray bar. The flow of the material is controlled by a lever on the nozzle of this attachment.

Rosco distributors are made for either truck or trailer mounting, but because of its economical advantages, the semi-trailer unit is highly recommended. These trailer units will carry a full load with a smaller truck at a speed of 25 to 35 miles an hour and return empty at 40 to 50 miles an hour. The fifth wheel, which connects tractor and trailer, allows the unit to be returned in an unusually narrow space.

All Steel Hydraulic Dredges

HYDRAULIC dredges are coming more and more into importance in contracting. Where once they were limited solely to the largest projects in harbor and stream channel work, today units of different sizes are used in levee construction, in some of the larger sand and gravel plants, on real estate developments and in reservoir maintenance. Hetherington & Berner, Inc., Indianapolis, Ind., are manufacturers of complete dredges including steel hull and superstructures and heavy-duty dredge pumps. A typical recent unit consisted of a 48 x 26-foot hull 4 feet deep fabricated in two sections which were joined together by turned bolts and an electrically welded seam and cover strip. Each section was composed of six water-tight compartments separated by bulkheads to give added rigidity and insure safety. The steel superstructure included a 5-ton trolley beam for handling heavy machinery and parts.

The cabin structure was covered by galvanized corrugated sheeting, weatherproofed, with large windows and doors. When completed, with the dredging equipment, the hull draws 18 inches of water.

Two hand winches at the rear of the boat handle the stern short lines. Large floodlights placed over the bow and stern permit night operation. This dredge has worked 750 feet of discharge line with the 10-inch H & B Type R heavy-duty dredge pump. This pump is equipped with a solid manganese shell, impeller and disc liners. The pump is direct-connected to a 250-horsepower, 720-rpm slip-ring motor with primary and secondary controls.

A sturdy A frame constructed of heavy steel sections braced by angles handles the suction line and is joined to the deck with hull trunnions. Heavy guy cables secured to the deck by clevises hold the A frame in place. The horizontal pipe in the suction line is supported by a swinging steel frame construction of channels and plates with clamps properly spaced to hold the pipe in place. The pipe support is attached to two I-beams aboard deck, by means of bushed pins, so as to permit the pipe to be raised or lowered. A series of sheave blocks for the front shore lines are supported above deck by a steel frame, and are so arranged as to permit the front short lines to be anchored at any point and allow the dredge to be swung freely, prevent kinks and relieve the strain in the cable itself.

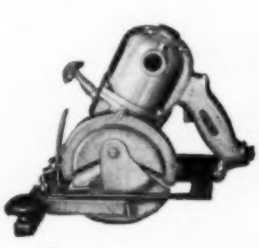
The vertical suction pipe is equipped with a suction cage having heavy steel cross bars with 7-inch open spacings so as to exclude larger stones. The suction line is arranged for digging to a depth of 45 feet below water level and an agitating device can be installed if desired.

The operator's platform where the controls for the winding machinery are located is supported 2 feet above the deck by a steel frame giving the operator a clear, unobstructed view. The suction pipe line passes under the platform. The hoist is driven by a 15-horsepower squirrel cage type 900-rpm motor equipped with an automatic starter. The hoist proper is mounted on two large steel beams to which the pipe support is attached. Auxiliary steel braces support the driving mechanism and lever quadrants. The dredge is equipped with vacuum and pressure gages for the suction and discharge lines respectively and also an ammeter for the dredge pump motor. Three 200-watt lights are provided in the cabin for night operation. This is an outline of typical H & B dredges which are built in sizes from 6 to 15 inches.

A Portable Electric Safety Saw for Light Cuts

A POWERFUL, light weight electric safety saw weighing only 14 pounds and with a 6-inch blade capable of cutting wood up to 1⅞ inches thick has been announced by the Stanley Electric Tool Co., New Britain, Conn. This saw is particularly adapted to cutting light form lumber, ripping flooring and many other services and where quick accurate work is desired on concrete forms. It may be used with an abrasive disc instead of the steel saw blade, in which case it can be used to cut or score tile, stone slate and roofing materials.

The outstanding safety features are a momentary contact switch and a swinging guard which covers the blade the instant the saw is disengaged from the work. A depth gage permits quick and accurate adjustment for the depth of cut and a ripping gage acts as a guide and gives the width of cut when ripping flooring. Seal type bearings on the armature and spindle exclude dirt and retain the lubricant. The gear and worm drive are continually supplied with oil through a continuous pumping action, insuring long life and quiet operation. This saw is powered with a Universal motor available for 110, 150, 220 or 250 volts.



The Latest Light-Weight Electric Hand Saw

A New Part-Circle Drainage Pipe

A NEW product designed to meet the need for a strong drainage structure which will give adequate waterway areas without the headroom necessary for a full-round pipe, has recently been announced by the Armco Culvert Manufacturers Association, Middletown, Ohio. This part-circle multi-plate pipe makes possible a flow area equal to 60 and 84-inch and larger full-round pipe where the height of the roadway makes the installations of those sizes of pipe undesirable or impractical.

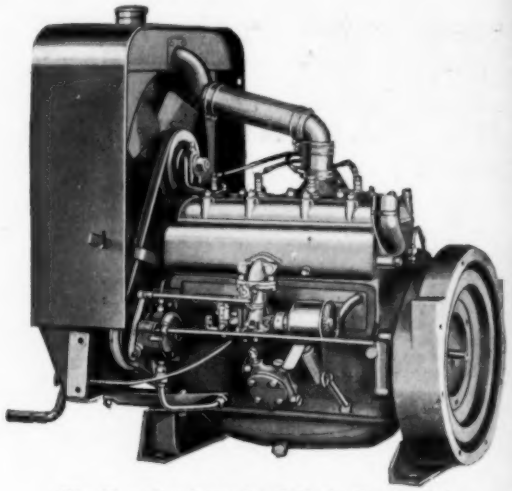
Armco part-circle multi-plate pipe is manufactured with 3, 4 and 5-arch plates which form spans ranging from 90 to 220 inches and in lengths of 5 feet or multiples of that number. The arch plates are available in any of the three standard gages, 3, 5 or 7. The ends of the base plates are turned up 4½ inches so that the arch can be bolted to the base. Corrugations are 6 inches from crest to crest and 1½ inches deep. The sides of the base plate are turned down with a 4½-inch lip to give stiffness and ample strength to prevent buckling under ordinary shallow fills where this type of installation would be used. The base plates are held together by the corrugated arch plates by bolts through the end flanges. All plates, both flat and corrugated, are of Armco Ingot iron.

Armco Part-Circle Multi-Plate Pipe Installed Under a Roadway

A New 4-Cylinder Engine

A NEW 4-cylinder engine of 74.83-cubic inch displacement for powering pumps, compressors, generators and similar units has recently been announced by the Continental Motors Corp., Detroit, Mich. This engine, known as Y400, is of 2¾-inch bore and 3 5/32-inch stroke and develops 10.75 horsepower at 1,200 rpm, the governed speed, and 17.8 horsepower at 2,000 rpm. It weighs only 250 pounds, or in power unit form including carburetor, magneto, governor, fan, radiator, gasoline tanks, controls, base supports and sheet steel housing, its weight is 350 pounds.

The crankshaft has three bearings 1 9/16-inch in diameter and is fully balanced. The connecting rods are drop forged steel with lower bearings of 1½-inch diameter, white metal alloy being spun into the rod. The semi-steel flywheel accommodates a heavy-duty industrial clutch. Intake and exhaust manifolds on the left side of the engine are fully water-jacketed, the thermo-syphon system affording efficient circulation. A carburetor of the vertical type is supplied with the complete engine, equipped with an air cleaner. A centrifugal-type gear-driven governor, automatically lubricated, provides variable control. Oil circulation by a vane pump driven from the camshaft supplies pressure feed to the camshaft bearings, crankshaft, connecting rods and gear case, maintaining 15 to 20 pounds pressure at 1,400 rpm.



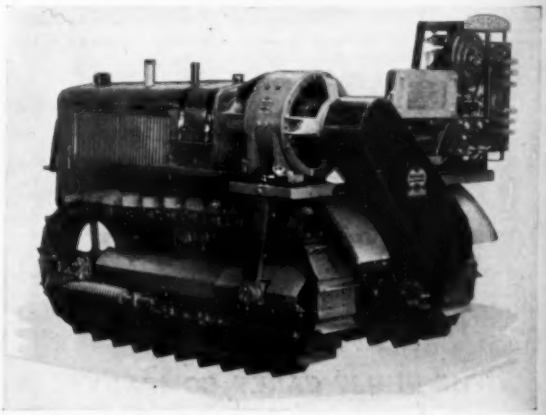
The New Continental 4-Cylinder Power Unit

The power unit mounting is of the base type with a rear support angle attached to the flywheel housing and a pressed steel front support. The radiator and gasoline tank may be mounted without using the usual power unit housing. Provision is made for a heavy-duty clutch and power take-off. A stub shaft for direct drive connection may be readily bolted to the flywheel. Reductions, with or without clutch, or right angles drives, can be supplied on order.

A Tractor-Mounted Welder

A WELDER of the type which can be mounted on the frame work of any standard tractor and is operated by V belt drive from the rear power take-off has recently been announced by Schramm, Inc., West Chester, Penna. Similar to the compressor mounting, the welder is located alongside the driver's seat on a removable sliding frame, with the control panel on the opposite side from the welding unit. This welder mounting does not affect the pulling or towing features of the tractor drawbar.

The welding unit is of the same type used in the portable engine-driven welders, of the single-arc, variable voltage design. Its sizes, for mounting on tractors of sufficient horsepower, include 200, 300, 400 and 600 amperes. This compact unit will travel over the roughest ground and operate under the same power. It is particularly adaptable to the increasing use of welding on pipe lines, bridge construction, building construction, tank erection and miscellaneous repair work.



The New Schramm Tractor-Mounted Welder

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